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Agriculture and Trade Report

Situation and Outlook Series

Bumper Grain Harvest



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Summary

China's 1990 grain production rose 6.7 percent to a record 435 million tons. Area sown to grain increased 1.2 percent to 113.5 million hectares. Excellent weather and increased input use raised yields 5.5 percent. All three major grain crops (rice, wheat, and corn) recorded record harvests. Rice output increased 2.7 percent to 185 million tons; wheat production was up 7.9 percent to 98 million tons; and corn output rose 14 percent to 90 million tons.

For 1991, total grain output is projected to decline to 415-425 million tons due to lower planted acreage and yields. China's planned target is 425 million tons. Two consecutive record grain harvests in 1989 and 1990, particularly the latter, dampened grain prices in open markets. Lower prices, together with higher input costs, decreased farmers' incentives to produce grain. China's 1991 summer grain crop (mainly winter wheat) reportedly has been reduced by heavy rains in the lower reaches of the Yangtze River Basin, and production of the crop is expected to be a few million tons below last year's record crop which has been estimated at 100 million tons.

A more reliable supply of inputs as well as good weather contributed to an increase in total oilseed crop production in 1990, reversing the trend of declining oilseed output since 1985's record crop. Soybean, rapeseed, cottonseed, peanut, and sunflowerseed output all increased. Rapeseed output surpassed the 1987 record by 5 percent, reaching 6.96 million tons. Total oilseed crop area for 1991 will increase, particularly cottonseed and rapeseed area. Total production is expected to increase in 1991, although individual oilseed output may decline slightly.

A substantial increase in the cotton procurement price, announced in late 1989, and additional inputs allocated to production helped raise 1990's cotton output to 4.51 million tons, 19 percent above 1989. Area was up almost 6 percent to approximately 5.5 million hectares. According to an early survey on planting intentions published in China's press reports, the 1991 cotton acreage is expected to increase as much as 1 million hectares. Actual planted area could increase as much as 500,000 to 1 million hectares. The exact figure is expected to be available in mid- to late-summer. Presently, 1991 cotton production is forecast to increase substantially (assuming normal weather conditions) but the magnitude of increase may vary significantly, pending the outcome of actual planted cotton acreage and the extent of damage from recent flooding.

Meat output was a record 25.14 million tons in 1990, 8.1 percent above the previous year. Pork output rose almost 1.6 million tons to 22.8 million tons despite government policies that encouraged poultry production because of its superior meat-to-feed conversion rates. A bumper 1990 harvest, particularly a good corn harvest, will increase feed supplies and facilitate meat output this year. Total meat output for 1991 is expected to exceed the planned-increase target of 700,000 tons.

China's 1990 gross national product reached 1.74 trillion yuan (\$364 billion), a real increase of 5 percent above 1989. The gross value of agricultural output grew 6.9 percent in constant

value terms in 1990, markedly higher than 1989's 3.3 percent primarily because of record crop and livestock production.

During 1990, general retail prices rose only 2.1 percent above the previous year (compared with a 1989 increase of 17.8 percent) in response to government austerity programs begun in late 1989 and continued through 1990. Average retail food prices increased 1.8 percent from 1989. Average retail prices for fresh vegetables and aquatic products increased 13.9 and 5.6 percent, respectively, while retail prices for some major foods declined: grain (-6.3 percent); and meat, poultry, and eggs (-3.1 percent).

Agricultural trade between the United States and China has grown significantly in the last two decades. Assuming that the United States continues to grant China most-favored-nation status, total U.S.-China agricultural trade is expected to gradually increase in the 1990's. With limited arable land and growth in both population and income, China's demand for imported grain is expected to increase towards the end of the century.

The agricultural trade balance has generally been in favor of the United States, but the volume has fluctuated in the 1980's. The fluctuation has mainly been caused by the variability in U.S. agricultural exports--particularly of grains. This variability can be largely attributed to the low priority the China Government has assigned agricultural imports, its lack of foreign exchange, its increased domestic grain production, and the trade disputes between the two countries.

U.S. agricultural exports to China in fiscal year 1991 are lagging and are expected to fall about 25 percent from the previous year's \$909 million, reflecting reduced wheat and corn shipments and lower wheat prices. The decline in China's grain imports is largely a result of consecutive record grain harvests in 1989 and 1990. Consequently, U.S.-China two-way agricultural trade could dip below \$1 billion in fiscal year 1991. Overall U.S.-China trade for fiscal year 1991, however, will top last fiscal year's \$19.5 billion.

Some regions in China are grain poor while others are grain rich. China's leaders organized a grain purchase and supply system to transfer grain from surplus to deficit regions. But lack of an adequate transportation system and a policy of local grain self-sufficiency led to grain shortages in large urban centers. China's leaders in the early 1960's bought grain on international markets to fill the gap between demand and supply. While grain production increased sharply in the 1980's, grain deficits continued to exist in some large urban areas. China's authorities will likely continue to purchase foreign grain to meet these requirements in the future because the internal transportation system is not likely to be improved soon.

Despite the loosening of its rigid control on agricultural production, the Government of China has continued to intervene heavily in its agriculture sector. With several upward adjustments in procurement prices, estimated producer and

consumer subsidy equivalents (PSE's/CSE's) indicate that China even subsidized some of its grain (rice and wheat) and oilseed (rapeseed and sesame) production for several years in the late 1980's. China's Government has always subsidized most agricultural commodities in urban areas. The May 1991 decision to reduce urban food subsidies (by raising retail prices for major food items) indicates how burdensome these subsidies have become for the government.

China's livestock feed industry has grown rapidly over the last 10 years as per capita incomes have risen and demand for meat has increased. This rapid growth has placed increased pressure on China's grain supplies but still provides less than 30 percent (about 30 million tons) of the total feed needed for livestock production. The limited quantity and low quality of

manufactured feed continues to hinder the development of more efficient livestock feeding operations. Caught between the competing demands for food and feed grains and the lack of an efficient transportation system to transfer feed grains to needed areas, China's Government is struggling to improve its livestock feed industry.

In the last decade, China has become the world's leading producer of farm-raised shrimp. Shrimp culture has provided China a valuable export commodity, with the majority of its exports going to the United States and Japan. In 1990, China exported 57,000 tons of shrimp worth over \$300 million to the United States. However, these imports are not counted as agricultural imports due to the U.S. trade classification.

Macroeconomy

GNP Growth Rate Up in 1990

China's 1990 gross national product (GNP) reached 1.74 trillion yuan, a real increase of 5 percent from 1989. GNP increased only 3.9 percent in 1989. Although China's leaders characterized 1990 as a year of continued economic retrenchment, some major adjustments were made to reinvigorate the economy following 1989's relatively poor performance. Government fiscal expenditures increased substantially, mainly because of increased support for floundering state enterprises, increased urban food-subsidy costs, and higher procurement costs for agricultural goods. Restrictions on new credit were loosened and fixed asset investments increased (table 1).

Despite gains in industrial production, consumer spending did not recover, leading to growing stockpiles of goods at enterprises, supply and marketing cooperatives, and retail stores, and exacerbating inter-enterprise debt problems. China's official statistics cite a central government budget deficit of 15.04 billion yuan, though Western analysts applying standard accounting procedures (e.g., excluding loan "revenue") have estimated China's true budget deficit at almost 50.9 billion yuan (1).

China's 1990 gross value of industrial output (GVIO), in constant value terms, grew at a more moderate 7.6 percent, down from 8.3 percent in 1989 and 20.8 percent in 1988. State-owned enterprises continued to perform particularly poorly, with growth far below either collective or individual enterprises (table 2). Broadly speaking, growth in the state sector was hindered by over-staffing, low productivity rates, serious problems with output quality, and few incentives to improve either efficiency or profitability.

Employment by yearend 1990 is reported to have recovered from the slump in 1989 and early 1990. Due to the

Table 1--Yearend macroeconomic indicators, 1989-90

	Units ¹	1989	1990
Population	Billion	1.127	1.143
GNP growth ²	Percent	3.9	5.0
Total loans ³	Billion	1240.9	1516.6
Total deposits ³	"	901.4	1164.4
Currency in circulation	"	234.4	264.4
Total state revenues	"	294.8	324.5
Total state expenditures	"	304.0	339.5
State budget deficit	"	9.2	15.00
Fixed asset investment	"	426.6	445.1

¹ All monetary indicators in Chinese yuan. ² GNP growth in constant value terms. ³ Yearend balance.

Sources: 1990 Statistical Communique and 1991 Statistics Abstract.

government's 1989 inflation-fighting retrenchment policies, many urban state enterprises were forced to lay off personnel. Frequently, however, workers were laid off but continued to receive a reduced salary. Central and local governments made a concerted effort in early 1990 to liberalize credit, offering large increases in low-interest loans to enterprises. This has allowed enterprises to increase production and many laid-off workers returned to their old jobs. A Labor Ministry official claimed that by the end of 1990, total urban unemployment was less than 2 percent, the same as before the economic downturn (2). The reported decline in urban unemployment, however, masks China's chronic urban under-employment in state-owned enterprises as well as the millions of former contract laborers who have returned to rural areas.

Table 2--Industrial and agricultural output value, 1988-90¹

	Units	1988	1989	1990
Total industry	Bil. yuan	1,822	2,202	2,385
State sector	% change	12.6	3.7	2.9
Collective sector	"	28.2	10.7	9.1
Private sector	"	47.3	24.1	21.6
Total agriculture	Bil. yuan	587	654	766
Crops	% change	-0.5	2.1	8.3
Forestry	"	3.8	0.9	2.2
Animal husbandry	"	10.5	5.5	5.9
Sideline products	"	10.4	5.8	3.4
Aquatic	"	11.8	8.0	6.7

¹ Total industry and agriculture values are calculated on the basis of current prices. The growth rates of the specific sectors are calculated on the basis of comparable prices.

Sources: 1988-90 Statistical Communiques and 1991 Statistics Abstract.

Gross value of agricultural output (GVAO) grew 6.9 percent in constant value terms in 1990 (markedly higher than either 1989's 3.3 percent or 1988's 3.2 percent), primarily because of record grain and oilseed harvests and a very successful cotton harvest. Grain production hit a record 435 million metric tons and cotton and oilseed output increased 18.1 and 24.7 percent, respectively. Measured in constant value terms, crop, animal husbandry, and forestry output growth improved over 1989, while sideline product and aquatic product output growth was less than last year (table 2).

Retail Price Inflation Moderates

During 1990, general retail prices rose 2.1 percent above the previous year, compared to a 17.8-percent increase in 1989 and an 18.5-percent increase in 1988 (3). Retail price inflation fell in response to the government's 1989 austerity program. The tight monetary policy also induced a steep drop in the rate of growth of capital and fixed asset investments, contributing to a decline in the rate of growth of state-owned enterprise industrial output in 1990 compared with the last few years.

The general cost of living for both urban and rural residents rose 3.1 percent from 1989. Average retail food prices increased 1.8 percent from the previous year. Average retail prices for fresh vegetables and aquatic products increased 13.9 and 5.6 percent, respectively, while retail prices for some other major foods declined, including grain (-6.3 percent) and meat, poultry, and eggs (-3.1 percent). Nonfood commodities showed varying increases in retail price, with fuel (32.0 percent), clothing (6.3 percent), and services (11.6 percent) prices showing the greatest increases. On average, 1990 commodity price increases were slightly higher in large and medium-size cities than in smaller cities and rural areas.

Trade Surplus in 1990

According to official China customs statistics for 1990 trade, China ran a total trade surplus in addition to an agricultural trade surplus for the first time since 1983. Total 1990 export value leapt more than 18 percent, while the total value of imports fell almost 9.8 percent. Agricultural trade in 1990 exhibited the same trends, though agriculture's share of both total exports and imports declined (table 3). Substantial currency devaluations in December 1989 (26.9 percent) and November 1990 (9.57 percent) and strengthened government restrictions on imports were important factors in the total trade surplus.

Table 3--China's foreign trade indicators, 1988-90

	1988	1989	1990
	US \$ billion		
Exports: ¹			
Total	47.54	52.538	62.063
Agriculture	9.46	9.702	9.771
Share (%)	19.9	18.4	15.7
Imports:			
Total	55.25	59.140	53.350
Agriculture	5.83	6.705	5.471
Share (%)	10.5	11.3	10.3
Balance:			
Total ²	(7.71)	(6.602)	8.713
Agriculture	3.63	2.997	4.300
Foreign exchange reserves	17,548	17,022	28,594
Avg. exchange rate	3.722	3.765	4.783

¹ Trade data is calendar year and on an f.o.b. basis.

² Numbers in parenthesis are negative.

Sources: China's Customs Statistics and IMF statistics.

Investment Expands in 1990 Under New Priorities

In 1990, the government pumped significant amounts of money into agriculture (through direct state investment and higher crop procurement prices), state-owned enterprises, and the primary and raw material sectors (particularly energy). Investment (by the central government) in state-owned

enterprises rose 10.5 percent, while investment in collectively and privately owned enterprises declined 2.8 and 5.6 percent, respectively. State-owned enterprise investment patterns reflected these new government priorities. Agricultural investment grew 31.2 percent above 1989, reaching 3 percent of total state-owned enterprise investment, while investment in energy or energy-related enterprises increased 15.6 percent to account for 29.9 percent of total investment.

Despite the funds poured into the state-owned industrial sector during 1990, many industrial indicators suggest that the state-owned sector, which contributed around 56 percent of China's total GVIO in 1989, has not recovered from the retrenchment policies of 1989 and 1990. State enterprise profits in 1990 declined 58 percent from 1989, and the turnaround period for working-capital funds increased from 109 days in 1989 to about 127 in 1990. Slack consumer and intermediate-user demand for goods has caused most state enterprises to either put output into inventory (reported to be growing extremely rapidly) or to "illegally" sell their output at lower-than-official state prices to attract buyers.

As with the state sector, the rate of growth of collective and private industry output also declined in 1990, though their growth was significantly higher than the state sector. Even with a decline in the rate of growth relative to 1989, the value of collective industry output nevertheless increased 9.1 percent, and the value of private industry output still rose a healthy 21.6 percent.

1991 Macroeconomic Outlook

In the first 4 months of 1991, China's GVIO (in constant value terms) increased 13.2 percent above the same period in 1990. And during the first quarter of 1991, state-owned, collective, and private-enterprise (including foreign funded enterprises) industrial output value rose 9.6 percent, 19.5 percent, and 42.8 percent, respectively, over the same period last year--all significantly higher growth rates than in 1990.

However, continuing the 1990 trend, most of the 1991 increase in industrial output is occurring in primary and intermediate industrial goods--not in consumer durables. Furthermore, the majority of the working capital and investment funds allocated to state-owned enterprises is either being used to service old debt or is tied up in unsold inventory. A China Industrial and Commercial Bank survey of 40,000 state enterprises found that, between January and August of 1990, 65 percent of the credit extended to industrial and commercial enterprises throughout the country remained locked up in stockpiles of unsold goods (4). This same trend is reported to be continuing in 1991. To address the retail sales and inventory problems, in April 1991 the central government authorized special "sale prices" for 20 billion yuan worth of industrial and consumer goods (5).

First-quarter 1991 statistics indicate that wages and bonuses are increasing faster than output, with workers' total wages rising 16.6 percent and bonuses rising 19 percent from the same period last year. Fixed asset investments are also on the rise, with total fixed assets owned by state-owned enterprises and institutions up 10.3 percent from the same period last year (6).

Plans to reduce the bottleneck in the supply of raw materials and energy for light and heavy industry through increased investment are yet to be realized. The value of first-quarter 1991 energy and raw material output was down 0.4 percent from the same period last year. And, during the first 3 months of 1991, the volume of coal production fell 0.4 percent from the same period of 1990, while the volume of crude oil, natural gas, and hydroelectric production only rose 1.0, 3.1, and 2.0 percent, respectively.

A number of articles warning of the danger of inflation during 1991 have appeared in China's press, particularly if central government expenditures to support inefficient or failing state-owned enterprises continues to rise. Other articles cite the funding burden placed on banks by the state agricultural commodity procurement system as a source of inflationary pressure. However, early indications are that, despite the surge in the money supply, consumer demand for retail goods has only improved marginally. And, with the relatively flat consumer goods market, demand for primary goods is also slow. Two consecutive years of bumper harvests have seen the prices of many agricultural commodities fall as well. In other words, until consumer confidence picks up--and assuming that 1991 will have another successful agricultural harvest--inflation will not likely be a problem until late in 1991 or even early 1992.

Consumer confidence is depressed for a number of reasons. A major reason is a general sense of uneasiness about the future course of reform. Private and collective enterprises, both urban and rural, suffered under the draconian retrenchment policies of late 1989 and 1990, with many firms forced to close. Some rural households have seen little or no real income increase because the state's fixed crop prices and increased production have not kept pace with rising input costs and because the 1990 recession diminished opportunities to earn extra income from work at local township- or village-run enterprises (7).

Other farm families have been hurt by the state's use of promissory notes (IOU's) instead of cash to purchase their crops. Well into the 1991 harvest season, some provinces reportedly have not completely paid off IOU's on the 1990 harvest. Still other peasant families are faced with stiff and, in many cases, still-rising fees levied by local governments seeking revenues. And finally, beginning May 1, 1991, urban families were confronted with a reduction in food grain subsidies. Short-term buying patterns were disrupted, characterized by large increases in grain purchases just prior to the price increase. Buying behavior since has evened out and is now below pre-price increase levels. However, the decline in grain and oil purchases will probably only have a small effect on actual consumption. Rather, much of the purchase decline will be accounted for by urban consumers reducing what has been estimated to be a significant amount of waste.

Bumper grain harvests in 1989 and 1990 have caused a huge amount of cash to be pumped into rural China through government procurements. Unlike 1987 and early 1988 when rural consumption levels were high, current rural household spending patterns have not recovered from the 1989-90 economic downturn. In fact, rural savings rates have climbed substantially throughout 1990 and early 1991. In early 1991,

this has helped to fund a reported 30-or-more-percent increase in agricultural investment by the Agriculture Bank of China and Rural Credit Cooperatives. And, while increased savings and investment are healthy for the agricultural sector, the lack of a recovery in rural consumer spending is hurting the industrial sector.

In conclusion, the outlook for China's economy in 1991 is neither wholly positive or negative. The increase in industrial output observed during the first quarter is artificially induced through massive government subsidies. Much of the output remains stored in warehouses or unsold on store shelves, although there was some improvement in February retail sales statistics. Private and collective rural enterprises, the driving force behind 1987's and 1988's rapid increase in Chinese industrial growth, have benefitted little from the increase in investment credits during 1990 and early 1991. Their output growth declined in 1990, although there has been some improvement in early 1991. Rural collective enterprise GVIO, which accounted for 36 percent of total GVIO in 1989, is reported to have risen 32.7 percent in the first quarter of 1991, compared to the same period last year. However, it should be noted that 1990 was characterized by extremely low output which exaggerates the amount of recent growth.

Restoring consumer confidence and thereby increasing aggregate demand remain important stumbling blocks to full recovery from last year's relatively poor performance in the industrial sector. However, the vast amounts of money washing around the economy could act as a catalyst for a new bout of rapid price inflation, if consumer demand rekindles sufficiently and industrial production does not improve. However, early indications of another successful agricultural harvest suggest that free-market food commodity prices will continue to be low in 1991, meaning any increase in prices will stem from either industry or government-instituted changes in controlled prices. While the general retail price level will almost certainly rise somewhat, inflation in 1991 should not increase much above 1990's 2.1 percent rate, assuming no major changes in China's government-controlled price system or in current state-set retail prices.

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References

1. Tai Ming Cheung, "Purse Full of Holes," *Far Eastern Economic Review*, June 7, 1991, p. 46-7.
2. "More Jobs Provided for Idle Workers," *China Daily*, Beijing, 06/07/91, p. 3.
3. The general retail price level is a weighted index of all list, negotiated, and free market prices (excluding services and agricultural producer goods sold to state-owned units). Price and total expenditure data (to determine weighting) collected in periodic sample surveys (*1991 Statistics Abstract*, pp. VI-VII).
4. "Central Bank Set to Trim Credit Layout," *China Daily Business Weekly*, Beijing, Jan 21, 1991, p. 4.

5. Li Hong, "Stockpiles Persist Despite Sales Rise," *China Daily*, Beijing, June 12, 1991, p. 1.
6. "First Quarter Industrial Production Up," *China Daily*, Beijing, April 28, 1991, p. 3, and "Rise of Industrial Production Noted," *China Daily*, Beijing, May 9, 1991, p. 2.
7. "Shenyang Monthly Agricultural Report," U.S. Department of Agriculture, FAS, May 1991, p. 3.

Agricultural Trade

In 1990, China's two-way agricultural trade declined to \$15.24 billion, a 7.1-percent decrease from the previous year, after consecutive increases in the preceding 5 years. The decline, mainly caused by an 18.4-percent drop in agricultural imports, amounted to \$5.471 billion. Agricultural exports actually increased marginally and reached \$9.771 billion (table 3). The increase resulted in part from the depreciation of China's currency late in 1989.

Agricultural Imports Declined in 1990

In 1990, China's agricultural imports decreased in all categories except vegetable oils. Edible vegetable oil imports have grown rapidly during the last decade, particularly in the second half of the 1980's. The value of all 1990 vegetable oil imports rose to nearly \$950 million, an increase of almost 13 percent over 1989.

The Government of China announced its decision early this year to raise vegetable oil tariffs in order to restrict increases in oil imports and promote domestic oil production through higher procurement prices. Vegetable oil tariffs were raised substantially, ranging from a 50-percent increase for palm oil to a 230-percent increase for soybean oil. Because of the tariff increases, China's vegetable oil imports will be curtailed in 1991. Also, an increase in China's 1990 oilseed crop output to 16.15 million tons, 25 percent higher than 1989's crop, will reduce the need for oil imports.

Grain imports decreased last year partly because of a 1989's record grain crop in 1989. The value of imported grains, mainly wheat, dropped 21 percent to \$2.353 billion. The 1990 wheat imports, valued at \$2.175 billion or 92 percent of the total value of grain imports, decreased 16.5 percent from the previous year. U.S. wheat exports to China declined to 3.7 million tons in 1990, down from 7.4 million in 1989 (see special article, "Two Decades of U.S.-China Agricultural Trade").

In 1991, China's agricultural commodity imports are expected to remain low, particularly for wheat and sugar, largely because of bumper 1990 harvests of both crops. Cotton imports will remain about the same as in 1990.

Agricultural Exports Up Slightly

In contrast to imports in 1990, the value of China's agricultural exports increased in almost all categories--including food, livestock products, beverage and tobacco, and vegetable oils. The few declines were concentrated in textile fibers, mainly silk,

cotton, ramie, cashmere, and rabbit hair. Lower export levels for these products, however, offset most of the increased value in other exported agricultural products. The 1990 agricultural export value therefore increased only slightly, less than 1 percent (table 3). In 1990, the share of the agricultural export value declined significantly to 15.7 percent of the value of China's total exports, compared with a share of 18.5 percent in 1989 and 23 percent in 1985.

China's agricultural exports are expected to be strong in 1991, particularly corn exports. Shipments of corn to neighboring countries, such as Japan and South Korea, have reportedly increased. Japan and South Korea prefer China's corn to corn from other sources because of fewer broken kernels and lower delivered costs. Both countries are close to China's northeast region, a major corn producing area. Exports of other agricultural products may also increase because of the devaluation of the Chinese currency in November 1990, although part of the increase will be offset by the elimination of government export subsidies on January 1, 1991.

Currency Devalued, Export Subsidies Eliminated

Increases in China's overall exports in 1990, including agricultural exports, were partly the result of recent depreciation in China's currency (Renminbi or yuan). There was a 21.2-percent depreciation in December 1989. China's Central Government has made a concerted effort to narrow the differences between the official exchange rate and the "market-determined" exchange rate at China's foreign currency "swap centers". Accordingly, on November 17, 1990, China devalued the yuan by another 9.57 percent. Since then, several smaller adjustments of the exchange rate have been made during the early months of this year. In addition to expanding exports, the government expects the adjusted rate to increase foreign investment inflows and make it easier to obtain credits from international lending institutions.

The second important trade policy change announced at the beginning of this year was the elimination of all central government export subsidies in order to reduce the burden on the central government's budget. According to the Ministry of Foreign Economic Relations and Trade (MOFERT), 4 percent of all exports were subsidized between 1988 and 1990. It was not clear whether the 4 percent subsidy referred to the quantity of exports or the percentage of the value of the subsidies spread across total exports. Nevertheless, the 4 percent figure appears extremely low, likely including only those goods that received direct subsidies. Indirect subsidies, for example subsidized inputs for household crop production, remain intact.

In all, the combined short-term impact of those two different reforms on China's agricultural trade will be minimal. Although recent reports from China indicate the country's domestic economy is expanding again following a 2-year period of stagnation and thereby increasing demand for imports, higher import prices caused by the devaluation should restrain at least the short-term increase in import demand. On the export side, the effect of the two policy changes will cancel each other out to some extent. The devaluation will lower export prices while the elimination of export subsidies will likely raise export prices.

Changes in the exchange rate, however, will have little impact, because the central planning authorities must authorize increased exports of all major agricultural commodities.

From a long-term perspective, both policy changes should have a positive impact on China's economy and trade. In addition to helping to expand exports, the devaluation will help China's access to international credit. And finally, the elimination of direct export subsidies may reduce some price distortions in the economy and enhance the performance and profitability of export manufacturers and trade companies.

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Agricultural Policies and Plans--China's Eighth 5-Year Plan

Goals and Targets for the Agricultural Sector

China's eighth 5-year plan encompasses 1991 through 1995. Details of the plan can be studied in a number of sources such as in "Keynotes of the Eighth Five Year Plan," published in the *Beijing Review*, January, 1991 (6). Broad statements of policies, objectives, and programs for all sectors of the economy are noted in the text of the plan, but only agricultural highlights of the plan will be featured here.

Table 4--Eighth 5-year plan agricultural output targets

	Seventh 5-year plan annual average	Eighth 5-year plan 1995 target output	Average annual increase
Million tons			
Grain	406.62	447.00	8.2
Cotton	4.04	4.64	0.1
Oilseed crops	14.46	17.26	0.6
Sugar crops	61.15	73.72	2.5
Meat	21.85	30.00	2.0
Aquatic products	10.42	14.50	2.3

General goals--In the coming 5 years authorities are planning for an annual average GNP growth rate of 6 percent, compared with a 7.8 percent growth rate for the Seventh 5-Year Plan period from 1986-90. The gross value of agricultural output (GVAO) is scheduled to grow at an annual rate of 3.5 percent compared with 4.6 percent during Seventh 5-Year Plan. The planned GVAO rate of 3.5 percent compares with a planned growth rate of 6.5 percent for industry and 9 percent for tertiary industry (3). The planned targets for individual agricultural products appear in table 4.

In the eighth 5-year plan authorities plan to provide investment funds to boost production in "production bases" (state-listed comprehensive agricultural development zones) and in

"vegetable basket" areas where the state plans to rapidly expand nonstaple food items around medium and large-sized cities. Officials believe rates of return will be higher there than in areas which have poor economic conditions. Output from these selected areas will be exported to deficit regions and to meet the requirements of 74 large and medium-sized cities (2, 4).

Population growth--Authorities aim to constrain annual population growth rates to 1.25 percent. Various rural insurance systems are scheduled to be established for aging farmers. Currently, parents in rural areas want to have several sons who are expected to provide care for them in their old age. An effective rural insurance program would provide for aging farm workers and hence lessen the desire to rear sons.

Government management of the economy--In the next decade China's Government aims to combine "planning with market regulation" to develop a "socialist planned commodity economy." This combination will bring into play the perceived advantages of both systems to promote a sustained, stable, and harmonious development of the national economy. Both mandatory and indicative planning mechanisms, plus market mechanisms, will be used to direct economic activity. In the coming decade, authorities plan to reduce the use of mandatory plans and limit this type of planning to broad matters of aggregate supply and demand. At the same time, officials plan to expand the use of guidance planning and markets to handle routine production operations, technical transformations, and small-scale construction. The principal economic management task of the state will be to use legal and administrative means to set overall control targets, insure correct consumption/savings ratios, and proper growth rates among industry/agriculture and heavy/light industry.

Raise living standards--One of the primary goals of the plan will be to raise living standards. Officials do not anticipate that living standards will be raised quickly across the whole country, rather standards will be raised on the basis of economic development in each region.

Develop poor areas--Authorities aim to support development in poor areas so that, first, citizens will have food and clothing to meet basic needs, and, second, that by the year 2000 most of the households in poor areas will enjoy improved lifestyles.

Investment--An important goal for the next 5 years will be to increase the funds available for investment in the agricultural sector from government, collective, foreign, and private sources. Government authorities plan to increase the percentage of funds spent on agriculture as a proportion of total investment in capital construction from 3.2 percent in 1989 to 6 percent in 1995 (5). The percentage of the fiscal budget spent to support agriculture should increase from 5.94 percent in 1989 to 8 percent in 1995. Agricultural loans as a percentage of national loans should increase from 8.4 percent in 1989 to more than 10 percent in 1995. Also, officials plan to reform the agricultural investment management system in 1992 and 1993 to allocate the budgeted capital construction investment funds among the relevant government functional units.

Township and village economic committees are scheduled to implement programs to induce farmers to invest their surplus

labor in capital construction projects. These committees are to set up mechanisms to accumulate capital from farm production units and from rural enterprises. Appropriate capital accumulation rates will be set. Also economic rules will be implemented to guide farm families to make investment decisions (5).

Financial--Authorities plan to reform the financial and tax system. Within the eighth 5-year-plan period they aim to stabilize the financial contract system and implement a system of sharing tax revenue between local and central authorities. The banking system will be reformed to strengthen the central bank's power to control the money supply.

The Agricultural Bank will be the main link between rural areas and the central bank. On the one hand, the bank will manage investment funds to support rural policy objectives. On the other hand, the bank will manage rural credit on purely business terms (5).

Officials plan to initiate two reforms in the rural credit cooperative system. First, credit cooperatives need to be brought under direct administration of the central bank (with possible separation of cooperatives from the Agricultural Bank). Second, internal mechanisms within cooperatives will be reformed.

Foreign trade and economic relations--Authorities want to widen the door to the outside world. Export expansion is desired. Foreign exchange should be used in part to support agriculture, water conservation, and transportation projects.

Internal commerce--Authorities aim to reform the material supply system and develop various marketing systems. Efforts will be made to eliminate all forms of internal trade barriers. State-owned shops and supply and marketing cooperatives will continue to be the mainstays in the commercial system, while collective and private firms will play a supplementary role. The state will establish a reserve grain-storage network. The state plans to improve food processing, packaging, storage, and transportation (3).

Transportation--During the eighth 5-year plan the primary emphasis in transportation will be to improve and expand the railroad network. Secondary emphasis will be to construct ports and highways linking large coastal cities (3).

Price reform--Authorities believe it is important to set rational prices for agricultural and manufactured goods. The practice of purchasing grain, edible oil, and cotton from farmers at relatively high prices and selling them to urban consumers at low retail prices needs to be resolved (2).

Education--The plan calls for compulsory universal primary education (grades 1 through 6) by the year 2000. Officials estimate that about 16 percent of the population (180 million) are illiterate. By the year 2000 officials plan to eliminate illiteracy among young and middle-aged persons. Accomplishing these goals will help the spread of modern farming methods and should boost yields as farmers can more readily read and follow technical directions in bulletins supplied by extension agents (3).

Continue the household land contract system--In the coming decade the household will continue to be the primary production unit. Authorities plan to continue to use the household land contract system as the primary mechanism for organizing rural production. Authorities expect that irrational land contracts will be revised, subcontracting will permit the formation of more optimal-sized production units, and procedures to resolve contract disputes will improve. At the same time officials continue their decades-old penchant to establish large-sized production units. Officials note that these large-sized units should be organized only where conditions permit and where they can be established on a voluntary basis.

Table 5--Eighth 5-year plan agricultural input targets

	Unit	1990	1995
Tractor plowed area	Mil. ha	48.0	56.7
Mechanically sown area	"	19.3	31.1
Mechanically harvested area	"	9.3	18.7
Mechanically irrigated area	"	27.0	28.0
Mechanized grain threshing	Mil. tons	300.0	350.0
Mixed feed mill capacity	"	56.0	70.0
Caged poultry capacity	Million birds	200.0	300.0
Rural power consumption	kW hrs.	295.0	357.0
Number of tractors-large	Million	0.9	1.1
Number of tractors-small	"	7.0	8.0
Number of farm trucks	"	0.7	1.0

Build a socialized service system--Authorities currently are in the midst of a vigorous campaign to build a socialized collective service system. The purpose of this service system is twofold. The first is to provide water, fertilizer, insecticides, farm machine services, agricultural technology, and post harvest processing services to farmers. Second, the system supplying these services will be under government control so that authorities can manage the economic and political behavior of rural citizens.

Increase inputs--Authorities plan to expand flood control and irrigation projects. Specifically they plan to divert water from the Yangzi River Basin to northern China. They plan to raise crop yields on currently low-yielding fields. The chemical fertilizer industry is scheduled to produce more than 100 million tons by 1995 (3).

Authorities plan to produce more equipment to support the development of grain production, seed processing, processing of forage grasses and feed for livestock, livestock-product processing, energy and water conserving irrigation equipment, processing equipment for sideline products, and energy-efficient internal combustion engines (7).

Forestry--The goal is to plant trees on 25 million hectares to raise the amount of national forest cover from the current 12.9 percent to 14 percent by 1995. High yielding timber is scheduled to be planted in the middle and upper reaches of the

scheduled to be planted in the middle and upper reaches of the Yangzi River Valley (3).

Rural industry--The total output value of township enterprises is targeted to increase by 66 percent to reach 1,400 billion yuan by 1995. Efforts will also be made to make enterprises more efficient, infuse higher levels of technology, and make the product mix more rational (3). Efforts will also be made to separate government administration from enterprise management. Stock share ownership structures for township and village enterprises will be promoted. Rural enterprises producing famous name brand goods and specialty products for export will be brought under the regime of state plans (5).

Rational land use--Authorities plan to gradually stabilize cultivated area and reduce the rate of losses. They aim to reclaim waste land and protect forest and grasslands.

Expand use of technology--Authorities aim to expand the number of agro-scientists and extension personnel and improve education levels of rural citizens. They plan to expand area sown to high-yielding varieties. The agricultural extension system will be improved through an infusion of trained personnel and through additional funds. A national network of science and technology service centers will be established (2). From 1991 through 1995 agricultural experimental areas will be established in five low-yielding areas of the Yellow-Huai-Hai River Plains; the Sanjiang Delta; and the Songhua and Nen River Plains in Heilongjiang Province; the Loess Plateau and nonirrigated areas in northern China; and the hilly red-soil areas in southern China. Within these five areas, researchers and experts are scheduled to establish 50 comprehensive experimental districts (1).

Reform post harvest distribution system--Officials plan to improve systems to distribute, store, process, and transport farm products. They plan to gradually build a national grain reserve system and develop wholesale markets. Purchasing, marketing, and price policies will be designed to promote grain production. Grain futures markets will only be developed gradually.

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Goals and Targets for the Food Processing Sector

During the seventh 5-year plan (1986-1990), China's processed food output grew at an annual average rate of 8 percent, slightly less than the 9.2-percent growth during the sixth 5-year plan. For 1990, the total value of processed food output is estimated at around 140 billion yuan, a 47-percent increase over the 95.2 billion yuan reported for 1985. Accepting the reports that only about 5 to 10 percent of China's total food output currently undergoes processing, the potential for future growth is significant (9).

The eighth 5-year plan (1991-1995), in general a continuation of the seventh 5-year plan, proposes China's Government focus on upgrading processing facilities and developing new products. The China National Food Industry Association (CNFIA), established in 1981 to coordinate the food industry throughout

China, has planned 180 new projects worth about 1.05 billion yuan for the next 5-year plan. The government plans to invest 20 billion yuan in the food industry over the next 5 years.

Food processing is already relatively well developed in China's coastal regions, e.g., Guangdong Province, because of the higher disposable income available to the population. However, central government planners are looking at promoting the development of food processing industries in rural inland areas, to take advantage of the physical proximity of much of the agricultural production and to promote rural industrial development.

China's Government hopes to increase its exports of processed foods in the future, though continued problems in meeting the more stringent health standards of Western Europe and the United States means that most exports will probably be targeted at Southeast Asia. However, rising prices and chronic shortages of packaging materials, including glass bottles, cans, and plastic wrap, have also constrained the expansion of exports.

According to the CNFIA, the eighth 5-year plan will emphasize the improvement and development of the following subsectors:

- Baby food production (milk powder, biscuits, strained fruits and vegetables, rice and soybean powder (a mixture sold as a baby food).
- Processing of health foods (fruits and vegetables).
- Dairy equipment.
- Flour mill equipment and technology.
- Equipment and technology to produce vegetable protein (soybean powder).
- Sugar plant equipment and technology.
- Freezing and cold storage equipment.
- Pasteurizing and sterilizing equipment.
- Food additive equipment and technology (citric acid, dry yeast, pigments).
- Modern food preservation technologies (irradiation for fruits and vegetables).
- Food packaging equipment, technology, and materials (plastics, treated paper).
- Convenience foods (instant noodles).
- Salt production equipment and technology (9).

References

1. "Agricultural Experimental Areas Program Set Up," Xinhua, Jan. 25, 1991, in FBIS-CHI-91-018, Jan. 28, 1991, p. 52.

2. "Agriculture Minister Liu Zhongyi on 10-Year Program for Agricultural Development," *Liaowang Overseas*, in Chinese, No. 15, April 15, 1991, pp. 14-16, in FBIS-CHI-91-091, May 10, 1991, pp. 48-51.
3. "Basic Tasks for 1991-1995 Second of a Series on Highlights of Draft Outline of China's Eighth Five-Year Plan," Xinhua, English, April 2, 1991, in FBIS-CHI-91-063, April 2, 1991, pp. 40-41, FBIS-CHI-91-064, pp. 28-30, FBIS-CHI-91-065, pp. 33-36, and FBIS-CHI-91-066, pp. 17-19.
4. Chen Junsheng, "Push Comprehensive Agricultural Development to Higher Stage," Speech at the National Meeting to Exchange Rural Economic Work Experience, January 28, 1991, *Nongmin Ribao*, March 22, 1991, p. 3, in FBIS-CHI-91-089, May 8, 1991, p. 45.
5. "CPC Central Committee's Proposals for Ten-Year Development Program and 8th Five-Year Plan," *Beijing Review*, February 18-March 3, 1991, pp. 21-27; and "Eighth Five-Year Plan Rural Reforms Outlined," *Tangtai*, No. 63, Feb. 9, 1991, Hong Kong, in JPRS-CAR-91-019, April 9, 1991, pp. 71-74.
6. "Keynotes of the Eighth Five Year Plan," *Beijing Review*, January 14-20, 1991, pp. 12-14.
7. "Rural Mechanization Goals for Eighth Plan," *Zhongguo Nongjinhua Bao*, Beijing, January 5, 1991, in JPRS-CAR-91-019, April 9, 1991, pp. 68-69.
8. "Statistical Communique on 7th 5 Year-Plan--Part I," Xinhua, March 12, 1991, in FBIS-CHI-91-053, March 19, 1991, pp. 42-45.
9. Adapted from Beijing Commercial Office Special Topic Report #3299: "Market Opportunities in China's Food Processing Sector During the 8th Five-Year Plan." Also see Francis C. Tuan, "A Note on China's Food Processing Industry," *China Situation and Outlook*, U.S. Department of Agriculture, ERS, July 1987, pp. 37-39.

Inputs

Production of Manufactured Inputs Increases

In 1990, farm supplies of manufactured inputs, such as electricity, chemical fertilizer, and pesticides, increased. Supplies of plastic sheeting used by farmers to increase soil temperatures, reduce moisture loss, and control weeds, decreased substantially. Yearend stocks of large and medium tractors and trucks decreased slightly, while stocks of small and walking tractors increased (table 6).

According to China Customs Administration statistics, fertilizer imports in 1990 rose substantially, increasing 16.8 percent over 1989 imports to almost 16.3 million tons. Of total fertilizer imports, urea imports rose 2.6 percent to 8.1 million tons, superphosphate imports fell 5.6 percent to 134,000 tons, potassium chloride imports rose 85.4 percent to 2.1 million

tons, and compound fertilizer imports rose 13.9 percent to 4.6 million tons. Fertilizer continued to be imported from the Soviet Union during 1990 under noncash border trade arrangements (central government controlled trade).

Input Supply System Unchanged for 1990

In early 1989, China reinstituted centralized control over input marketing and distribution in response to rapidly increasing prices, artificial shortages, and peasant discontent over corrupt cadres diverting low-priced state fertilizer supplies to the open market to be sold at a premium. Following recentralization, all inputs were again channeled through the government controlled Supply and Marketing Cooperatives (SMC's) and the two-tier pricing system was abolished.

Table 6--China's major manufactured farm inputs, 1988-90

Item	Unit	1988	1989	1990
Yearend stocks:				
Lrg-med tractors ¹	1,000	870	848	814
Hand tractors	"	5958	6543	6981
Rural trucks	"	591	625	624
Machinery production:				
Lrg-med tractors ²	"	47	40	39
Hand tractors	"	1336	1118	1100
Rural electricity				
consumption ³	Mil. kWh	71200	79050	84450
Fertilizer output ⁴				
Nitrogen ⁴	"	13653	14241	14797
Phosphate ⁴	"	3692	3728	4255
Potassium ⁵	"	(54)	(56)	(68)
Fertilizer applied	"	21415	23571	25903
Chemical pesticides	"	179	208	229
Plastic sheeting	"	337	392	331

¹ Capacity of 14.7 kW or more. ² Both wheeled and crawling tractors with a capacity of 14.7 kW or more. ³ Not all for agricultural production. ⁴ Effective nutrient weight. ⁵ Numbers in parenthesis are derived.

Sources: 1990 China Statistical Yearbook, 1991 Statistics Abstract, China's Customs Statistics, and various press reports.

Since the government monopoly over input distribution and sales was reinstituted, the distribution of inputs has stabilized to some extent. All fertilizer prices, including ex-factory, contract-supplied, and retail, are government controlled. Interestingly, since remonopolizing distribution, the government has allowed input prices to increase substantially to cover rising production costs at fertilizer factories. Supplies are now reported to be steadier and demand has diminished somewhat since the government has allowed prices to move closer to a demand-clearing level.

Most farmers are reported to be satisfied with the decline in corruption and the regularization of supply, though the increase

in prices and low quality have squeezed farmers' profits. The increased cost of inputs (December 1990 prices were up 5.5 percent from December 1989 prices) has diminished income gains from higher crop procurement prices, particularly for more input-intensive crops such as cotton or sugar crops. Similarly, the low quality of supplies has increased costs by requiring greater quantities of inputs to maintain effectiveness.

Outlook for Supply of Inputs in 1991

Total chemical fertilizer production in 1990 was 19.12 million tons on an effective nutrient weight basis (or 90.7 million tons on a product weight basis), an increase of 6.1 percent above 1989. This was up slightly from the 4.1 and 3.6 percent increases of 1988 and 1989, respectively. The state plan target for 1991 fertilizer production is variously reported as 90 and 92 million tons, including a 5-percent or 1.2-million-ton increase in urea production (for nitrogenous fertilizer), a 100-percent or 190,000-ton increase in potash production, and a 35-percent or 200,000-ton increase in compound fertilizer production. Total available supply for 1991 is set at 115 million tons, implying fertilizer imports and stock use of 23 to 25 million tons. The pesticide production target is 210,000 tons, including 164,000 tons of insecticide, 21,000 tons of fungicide, and 26,000 tons of weed killer. The plastic sheeting output target for 1991 is 450,000 tons.

In the first 2 months of 1991, China's fertilizer production was 13.92 million tons, up 3.2 from the same period in 1990. Extended to the entire year, this implies a 1991 output of approximately 93.5 million tons, slightly higher than even the official State target. By the end of the first quarter of 1991, agricultural plastic film (sheeting) production had reached 126,700 tons, 5.1 percent above the same period in 1990. If the 5-percent growth rate can be maintained, then the 1991 output of plastic film could surpass 500,000 tons, though a reported central government policy to gradually reduce production may induce slower or negative growth later in the year (note that 1990 production was 61,000 tons less than in 1989). Finally, chemical pesticide output during the first quarter of 1991 was 64,700 tons, up 11.6 percent from the same period in 1990, implying total 1991 output of over 258,000 tons.

The current healthy growth in fertilizer production is reported to be threatened by slow sales and rapidly rising inventories. In early 1991, a number of reports in China's press observed reductions in peasant purchases of agricultural inputs. This was due to concern about declining profit margins, as grain prices have fallen and input prices have risen. However, more recent reports indicate that fertilizer and pesticide sales to farmers have been brisk, with the exception of February because of the Chinese New Year and the fact it is a short month. A farm household survey in Jilin Province, for instance, indicated that 1991 expenditures for fertilizer, pesticides, plastic sheeting, grain seeds, and diesel fuel were up 12.3, 29.3, 14.8, 54.9, and 71.4 percent, respectively, from the same period in 1990.

China's smaller fertilizer plants, accounting for about half of total output, had a combined inventory of nearly 6.3 million tons by the end of February of this year. According to the

Ministry of Chemical Industry, this figure is almost 71 percent higher than the same period in 1990. Accordingly, many factories are operating at less than normal capacity, down some 10.5 percent from 1990. If these problems cannot be resolved quickly, China may be hardpressed to reach its 1991 target for fertilizer production.

Some effort is being made to restructure the output of China's more-than-2,000 small fertilizer factories. These factories, which contributed about 56.4 percent of total fertilizer output in 1990, will be pushed to retool in order to produce the more efficient but scarce urea fertilizers rather than the less efficient but abundant nitrogenous fertilizers. During 1991, the state will invest 200 million yuan towards converting 195 factories to urea production.

Fertilizer imports in 1991 are expected to increase above 1990 levels. The average annual increase in total fertilizer imports between 1986 and 1990 was 38.2 percent, while the 1990 increase above 1989 was 16.8 percent. Assuming that China will only increase imports by 10 to 15 percent, total 1991 fertilizer imports will be about 17.9 to 18.7 million tons. However, if all Sino-Soviet trade finally moves to a cash rather than barter basis as the Chinese officials hope, this number could be reduced significantly. To date only central government-to-government trade is conducted on a cash basis.

Eighth 5-Year Plan Input Targets

China's eighth 5-year plan (1991-1995) targets fertilizer output at 100 million tons, an increase of about 16,500 tons in 5 years. Given the 26.7-percent growth rate of fertilizer output between 1987 and 1990, and assuming implementation of the central government's announced commitment to focus resources to develop the chemical industry during the eighth 5-year plan, it seems likely that China will be able to meet, if not exceed, its 100-million-ton target for chemical fertilizer output by 1995.

The eighth 5-year plan establishes a goal for farm machinery production at an average annual growth of 6 percent. Between 1990 and the end of 1995, the annual production of large tractors (over 45-horsepower) is planned to increase from 60,000 to 100,000 units. Output of small tractors (20-40 horsepower), on the other hand, is expected to decline almost 100,000 from current levels. Although the central government intends to invest 1.3 billion yuan in renovating and updating the technology of 130 of China's 2,200 farm machinery factories, this is a reduction of 400 million yuan from investment during the seventh 5-year plan. Furthermore, capital construction investment is also expected to decline to only 203 million yuan, falling 35 percent from the seventh 5-year plan. If the planned reduction in central government support of the farm machinery industry occurs, farm machinery output will likely stagnate near current levels or increase only slightly.

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References

1. "1991 Cotton Annual Report," CH1036, U.S. Department of Agriculture, FAS, June 1, 1991.

2. "Shenyang Monthly Agricultural Report," U.S. Department of Agriculture, FAS, May 1991.
3. Various *China Daily*, *Foreign Broadcast Information Service*, and Joint Publications Research Service articles published during 1990 and 1991.

Agricultural Production

Grain

Record Production in 1990

Production of wheat, rice, coarse grains, soybeans, potatoes, and pulses totaled 435 million tons in 1990, up 6.7 percent from 1989. Excellent weather and growing conditions plus increased inputs raised yields 5.7 percent. Area sown to these grain crops increased by over 1 million hectares, to 113.3 million (appendix table 1). However, tabulating grain production reported by provincial statistical communiques, newspapers, and radio broadcasts, suggests a harvest in excess of 445 million tons.

This larger-than-anticipated crop brought problems as well as solutions. Government purchase stations did not have sufficient grain handling facilities to manage the volume. Press reports note that as much as 20 million tons of grain have been stored in the open air and that large quantities of grain have been stored in temporary bins where high loss rates are expected. The state has also contracted with farm families to hold state grain stocks and families have also increased their own stocks as well. Government-owned grain purchase stations in some localities stopped buying farmers' grain due to lack of storage space and lack of cash. Other grain purchase stations had storage space but not cash. These stations issued promissory notes (IOU's) to farmers for their grain. Open market prices for various kinds of grain fell, reducing farmers' incentives to produce grain for 1991. With grain bins bulging, China's grain trade officials reduced grain imports and increased grain exports.

According to China's customs statistics, it was a net importer of grain in 1990, exporting 5.8 million tons, compared with 13.6 million tons of grain imports. Excellent grain harvests in 1989 and 1990 boosted domestic supplies causing grain import requirements to fall 18 percent from 1989. Grain exports decreased from 6.57 million tons in 1989 to 5.83 in 1990, an 11-percent decrease.

Wheat production in 1990 reached an estimated record of 98 million tons (China's press articles report a crop of 100 million tons). Area sown to wheat rose to 30.8 million hectares, an increase of 959,000 hectares. Yields were a record 3.18 metric tons per hectare, largely because of favorable weather conditions. Poor weather conditions reduced yields in the northeast spring wheat region in 1989, but weather conditions improved in 1990. Also yields were up because of more irrigation, more chemical fertilizer, and better field management.

Rice output for 1990 hit a record 185 million tons (paddy basis), up 2.7 percent from 1989. Sown area expanded 400,000 hectares to 33.1 million. Government policy pressured farmers to keep area in rice rather than switching to more profitable crops. Farmers in the north and northeast regions (see special article figure A-1) expanded area sown to rice which offset minor decreases in traditional rice-producing regions in the south. Yields rose to 5.6 metric tons per hectare, an increase of 1.5 percent. The primary reasons for the yield increase were generally favorable weather and expanded use of hybrid seed, which reached 15.9 million hectares in 1990 (see figure 2). China's officials note that hybrid rice strains generally outproduce traditional varieties by 750 to 1000 kilograms per hectare.

Coarse grain production (corn, sorghum, millet, barley and oats) rose to a record 106 million tons, up 11.8 percent from 1989 (appendix table 1). Most of the increase came from expanded area sown to corn and a significant rise in corn yields due to very favorable weather conditions, expanded use of hybrid seed, and chemical fertilizer. Area sown to most of the other coarse grain crops decreased in 1990.

Production Likely Down in 1991

Total sown area for 1991 is estimated to decrease over 2 million hectares to 111.3 million hectares in spite of government and party campaigns to raise more grain crops in 1991. The giant 1990 crop depressed market prices for various kinds of grains in late 1990 and early 1991. But input prices have continued to rise, so that farmers intending to raise grains this year will face lower profit margins. News reports from China note that retail sales of inputs have been sluggish this spring, indicating that farmers are constraining the use of inputs this year, which will reduce yields. ERS analysts forecast a total grain crop of about 420 million tons for 1991 (China's planned target is 425 million tons).

Grain farmers in 1991 face a complex array of conflicting signals about how much grain to produce. Within the past decade China's grain economy has become increasingly complex. The special article in this report entitled "China's Grain Production Economy: A Review by Regions" highlights the different experiences various regions have had over the last three decades. Another way of viewing the national grain economy is not as a single entity, but rather as consisting of three sub-parts: the state, the market, and the self-sufficient grain economies.

The State Grain Economy

China's leaders are pressing farmers to expand grain production in 1991. They will try to pressure farmers not to reduce grain area. The fact that farmers expanded winter wheat area by several hundred thousand hectares for the 1991 harvest is indicative of the power that the state possesses. The leaders are determined not to repeat the mistake made in 1985. In 1984 farmers reaped a bumper harvest, but output dropped from 407 million tons to 379 million in 1985. High level authorities used the drop in output to level economic and

political mismanagement charges at then Premier Zhao Ziyang. Even as farmers and government grain purchase officials were struggling to store the 1990 record crop, Premier Li Peng initiated policies and directions for government cadres to keep up the pressure to expand output for 1991.

The state grain economy, composed of two parts, has a significant impact on nearly 25 percent of the total grain economy. First, there are government-owned state farms which cultivate about 4 percent of China's total cultivated land. The State Farm Bureau (under the Ministry of Agriculture) uses state planning mechanisms to manage grain production decisions for the 2,000-plus state farms.

Second, the Grain Bureau (under the Ministry of Commerce) manages the "grain purchase and supply system" which was established in the mid-1950's. The Grain Bureau uses numerous mechanisms to manage the "grain purchase" system and to control the grain economy. Its most important tool is to require that specified farmers sell specific kinds and quantities of grain to state grain purchase stations at relatively low, state-fixed prices. Households, especially in grain surplus areas, must sign grain purchase contracts with Grain Bureau cadres as a condition of receiving contracted land from village economic cooperatives. To encourage farmers to deliver grain, the government has a program to deliver specified quantities of chemical fertilizer, diesel fuel, agricultural chemicals, and plastic sheeting to farmers who have signed grain purchase contracts with grain stations. These input supplies are rationed to farmers in the program, and prices for these goods are reduced through government subsidies. Normally the government purchases about 50 million tons of grain through this fixed price system, meeting almost half of its total requirements.

The government purchases the other half of its requirements through negotiated prices. Grain Bureau cadres sign negotiated grain purchase contracts with farmers in the spring in which they promise to buy grain in the autumn at a specified price, usually a little lower than the prevailing open market price. In fall 1990 the Government invoked protection prices for wheat (925 Renminbi [RMB] or yuan per ton), rice (1,000 RMB per ton), and corn (610 RMB per ton) to bolster peasant resolve to cultivate these grains in 1991. The government announced the policy that the Grain Bureau would purchase any quantity of grain that farmers wanted to sell at protection prices. But lack of grain storage space and paucity of cash made some local grain purchase stations unable to buy farmer's grain. Some grain purchase stations simply closed their doors (*guanmen*) and refused to buy grain from farmers. Other purchase stations short of cash issued promissory notes to farmers. As noted earlier, farmers in late 1990 and early 1991 had millions of tons of grain to sell to the state but grain purchase stations failed to make the purchases. This failure damaged the government's effort to encourage farmers to expand production in 1991.

Aside from the above-mentioned programs designed to boost grain output in 1991, the government and Communist Party use other means to pressure farmers to raise grain. The most powerful bodies in many rural areas are local Party committees and branches. Cadres in these units often wear several hats, that is they have duties in the Party while simultaneously serving as officers in government and collective institutions.

For example, Party members serve as leaders in organizations which deliver inputs to farmers, such as irrigation water, electricity, farm machinery, diesel fuel, and seed. Party members also serve as officers in banks which supply credit to farm production units and they control the supply of agricultural extension technology to farm families. Promotion potential within the Party depends in part on how well Party members implement government and Party policies. If Premier Li Peng announces that farmers should cultivate more grain, these cadres have strong incentives to follow the Party line and have some very powerful tools at their disposal to encourage farmers to expand grain area.

Cadres have some control over the functioning of local open markets. For example they decide when certain grains can enter the market, the quantities which can be sold, and the price ranges at which grains can be exchanged. Party members are also integrally involved in the land contract system. In some cases one Party member is assigned to supervise the contracts of a dozen households. These individuals can put strong pressure on farmers to raise grain crops when they negotiate annual production contracts with them.

The Grain Bureau also manages the "Grain Supply" system, which transports raw grain from farms, stores, and mills, distributes intermediate grain products to breweries, feed mills, and bakeries, and retails final food products largely to urban consumers. Retail prices for urban grain rations were set in the 1960's and had not been changed for three decades. Because the Grain Bureau increased the purchase price it paid to farmers during the same time period, a gap between the purchase and selling price developed. At first the gap was small and the central government budget had no difficulty handling the subsidy. For example, in 1978 the state subsidy for food grains and edible oil was 3.6 billion RMB. But by 1980 the figure had increased to 10.8 billion RMB, and in 1990 the subsidy reached 40 billion RMB, about 10 percent of total central budget expenditures.

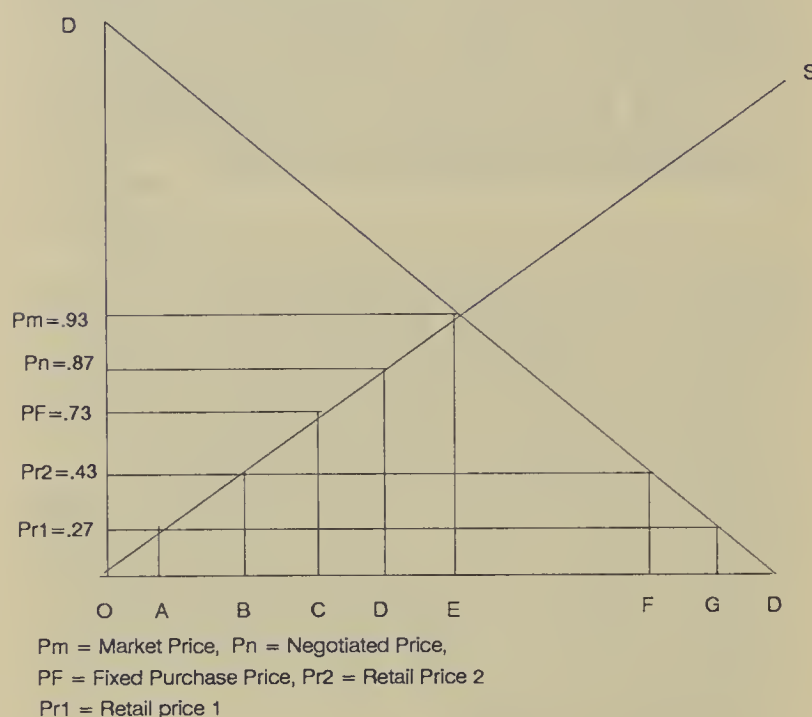
In an effort to reduce central budget expenditures for food subsidies, the government in May 1991 announced price increases for grains rationed to urban residents. For example the price for wheat flour rose 56 percent from 0.37 RMB per kilogram to 0.56 RMB. Milled rice prices rose 70 percent (from 0.33 RMB to 0.56 RMB), and corn flour prices rose 64 percent (from 0.22 RMB to 0.36 RMB per kilogram). At the same time the government plans to give workers, employees, retired staff, military, and university students an income subsidy of 6 RMB per month to compensate for the price increase. Current wheat prices are used to highlight the economic consequences of the price increase and the income subsidy in the simple supply-and-demand framework depicted in figure 1.

In 1990 the Grain Bureau purchased wheat from farmers at the fixed quota price of 0.73 RMB (OC) and at the negotiated price of 0.874 RMB (CD) for a total of quantity OD. At the same time the Grain Bureau retailed flour for 0.274 RMB per kilogram (Retail 1). At that price, citizens would like to purchase quantity OG, but the Grain Bureau had only purchased quantity OD and subsequently used its rationing system to distribute flour to ration card holders. The difference between OG and OD is the excess demand for flour at the low,

subsidized price. By raising the retail price for wheat (retail 2) citizen demand for flour will be reduced as consumers substitute lower priced food products to meet their requirements. Excess demand for wheat will be reduced from DG to DF.

Government authorities intend to give ration card holders an income subsidy to help consumers adjust to the higher retail wheat prices. Some of this additional cash income will not be spent on flour, as consumers allocate their budgets among other goods. Higher flour prices will encourage users to reduce waste.

Figure 1
China's Current Wheat Prices



China's officials have recently estimated that their system loses around 15 percent of their total grain crop through waste. The net effect of the price increase therefore will be to lower the demand for flour in urban areas. Before reforms in 1989, Poland had a similar grain supply system which led to excess demand conditions and long queues. As markets began to function in 1989, queues disappeared and excess demand for food products was reduced as consumers adjusted their purchases and substituted among products.

The Market Grain Economy

Before 1949 marketing functions were performed by a combination of village/township markets and wholesale grain markets. The government's "grain purchase and supply system" implemented by the Grain Bureau took over grain marketing functions from wholesale markets after 1949. From 1953 to 1962 government authorities restricted the functions of rural open markets. From 1962 to 1966 rural open markets were allowed to function, but from 1966 to 1978 authorities closed them (1). Since 1978 an increasing quantity of grains have

moved through open markets. In 1990 authorities in Beijing estimated that open markets handled about 10 million tons of grain (1), while the U.S. Agriculture Office in Beijing reported an estimate of 65 million tons (5). Open markets have developed rapidly, but reporting on market activity has lagged.

In a separate development in mid-October 1990 China's government authorities, with technical assistance from the Chicago Board of Trade, opened a wholesale grain market in Zhengzhou, Henan Province. This market is designed to assist the movement of about 3 million tons of negotiated-price wheat from one province to another. The Zhengzhou market will handle mostly wheat but can also handle other grains. In mid-January 1991 a wholesale rice market opened at Wuhu in Anhui Province, and in mid-March 1991 a wholesale corn market opened in Changchun, Jilin Province. ERS analysts estimate that about 25 percent of China's grain output is strongly affected by wholesale and local market activity.

Bumper spring and fall grain harvests meant that supplies exceeded demand and prices fell throughout 1990. For example wheat prices fell 16 percent from 993 RMB per ton in February 1990 to 830 RMB in December. During the same period, prices for inputs such as diesel fuel and chemical fertilizer increased, resulting in lower farm profit margins. Relatively low current market prices for grain and rising input costs are sending strong signals to farm production units to reduce grain output in 1991.

The Self-Sufficient Grain Economy

Rural income and expenditure surveys conducted in the mid-1980's show that rural families obtained more than half of their food from their own production. There are two reasons for this high degree of self-sufficiency. China's vast space, dissected by many mountain ranges and deserts, are connected by a relatively poor transportation and communication system which forced many areas to become self sufficient. Secondly, government and Party policy stressed local self-sufficiency from the mid-1960's to 1978. Currently there is less stress on local self-sufficiency than before.

Insuring that one's own family will have adequate grain rations to sustain itself is a fundamental motivating force in China's countryside. This impelling force pushes farmers to continue to produce grain year after year. It is well to remember that many farmers will raise grain for their own use regardless of what happens in markets or what government policy may dictate.

Since the breakup of the commune system in 1984, farm families have begun to store grain. Where growing conditions are poor and the probability for crop failure is high, such as in Inner Mongolia, farm families keep 2 to 3 years of grain in stock. Grain stocks are viewed as life insurance policies against bad weather, crop failures, farm accidents, and illness. Where growing conditions are good and the probability of crop failure is low, farm families reduce the quantity of stocks they hold which permits members of the family to specialize in other crop and livestock production and off-farm activity.

What kind of grain production decisions will farmers in the self-sufficient economy make for 1991? A large portion of them

will follow tradition and continue to produce grain for their families. But some families will decide, because the grain jars are full and they can purchase some grains in local markets, that they can survive a whole year even if there is no grain harvest in 1991. These families therefore will continue to plant grain, but likely will divert some area to cash crops, fruits, and vegetables, and shift some labor from raising grain to earning cash through nonagricultural activities.

1991 Grain Production

In summary, grain area for will be down slightly in 1991. The decrease in area, driven by lower profit margins due to lower grain prices and higher input prices, will offset government and Party efforts to boost grain output. Grain area will fall because farm families have large grain stocks and will try to improve their welfare by allocating their land resources to more profitable crops and their labor to activities with higher rates of return.

Wheat output for 1991 is forecast at 95 million tons, 3 million below the record 1990 crop, but still the second best harvest on record. Government policy in autumn 1990 pushed farmers to expand area sown to wheat, but area is forecast to be the same as last year, 30.8 million hectares. USDA assumes that yields will fall from the 1990 record because of heavy rainfall during the harvest season in the Yangzi River Valley and because higher input costs will encourage farmers to use inputs judiciously.

Rice production likely will decrease because of reduced area and yields. Rice area likely will be reduced to 32.6 million hectares, down 500,000 hectares from last year, as farmers shift available paddy land to more profitable crops (cotton, oilseeds, sugar, fruit and vegetables). Growing conditions for rice were excellent in 1990, but the return of more normal weather patterns could reduce yields this year. Rising input costs also will constrain yield growth. Area sown to hybrid rice is scheduled to expand in 1991 to 16.5 million hectares, and China's agricultural authorities forecast area will expand to 19 million in 1995 (figure 2).

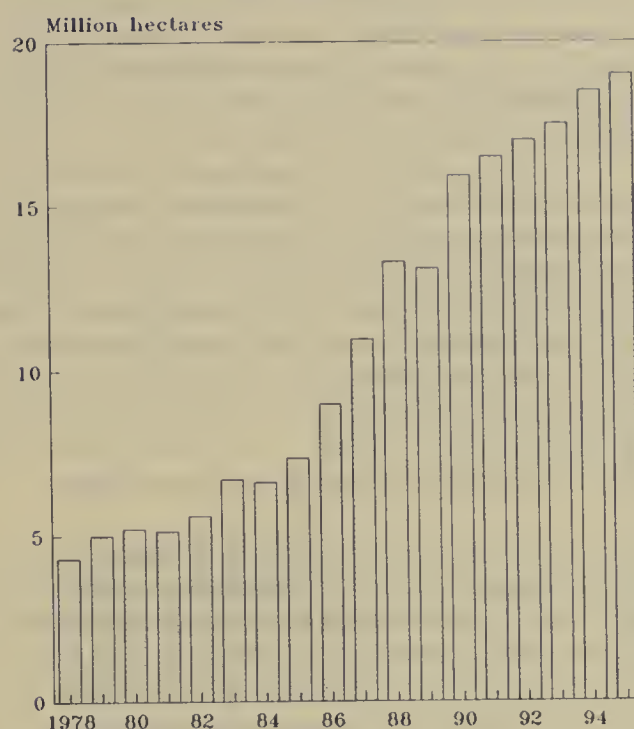
Coarse grain outturn is expected to decrease to 0.8 percent to 105.1 million tons. Farmers likely will sow less in 1991 because large stocks and falling prices, along with rising input costs, have reduced profit margin prospects. Authorities expect to expand the use of hybrid corn varieties by several hundred thousand hectares which will somewhat reduce the potential decline in production.

Grain Imports Likely Higher in 1991

Wheat imports on a calendar year basis (all calendar year data come from China's Custom Service) fell from 14.88 million tons in 1989 to 12.53 million tons in 1990, largely because of excellent domestic wheat crops in 1989 and 1990 (appendix table 7). A smaller wheat crop in 1991 will lower domestic supplies so that imports for 1991/92 (July-June) are forecast at 10.5 million tons.

China is both a rice importer and exporter. In 1989 China

Figure 2
Area Sown to Hybrid Rice



imported the unusually large quantity of 1.2 million tons of rice. But in 1990 imports totalled only 50,000 tons. China likely will not import large quantities of rice in calendar year 1991 because of the record 1990 crop, because prospects are good for the 1991 crop, and because tight central government controls restrict provincial participation in foreign grain trade. USDA forecasts that China will import only 50,000 tons in 1991.

In 1989 China exported 300,000 tons of rice and in 1990 shipped out 330,000 tons. China is prepared to export more rice in 1991 because of 1990's record crop, a crop so large that farmers and government granaries had difficulty storing it all. But CEROIL (China's foreign trade corporation responsible for the import and export of grains and edible oilseeds) likely will not be able to export as much as hoped because regular customers had good crops in 1990. USDA forecasts that China will export 550,000 tons of rice in 1991.

China is also an exporter and importer of corn. In calendar year 1989 CEROIL imported 438,810 tons, compared with 403,560 in 1990. But with the record 1990 corn crop (90 million tons), USDA forecasts that 1990/91 (October-September) imports will be negligible. In calendar year 1989 CEROIL exported 3.5 million tons of corn and 3.4 million in 1990. Corn exports picked up in the last months of 1990 and early 1991 as government granaries attempted to move corn out of stocks to make way for newly harvested corn. The corn crop was so large in Jilin Province that some of the crop had to be stored in the open air. USDA forecasts that corn exports for 1990/91 (October-September) will reach 5.5 million tons. Most of the corn will be shipped to the far eastern portion of the USSR, North Korea, South Korea, Japan, and destinations in Southeast Asia.

Barley imports (on a calendar basis) totalled 650,000 tons in 1990 a sharp increase from 246,000 tons in 1989. Part of the increase stems from larger imports of malting barley, largely from Australia, to supply China's growing beer industry (6.7 million tons of beer in 1990). USDA forecasts barley imports for 1990/91 (October/September) likely will increase to 700,000, up 100,000 tons from the previous year.

China has long been an exporter of dried pulses, averaging 65,000 tons a year before WWII. Pulse exports continued after 1949 and averaged over 100,000 tons in the 1960's. In the late 1980's exports averaged just over 500,000 tons a year. In 1990 pulse exports expanded to 760,000 tons, worth \$244 million. The bulk of China's pulse exports go to Hong Kong, Japan, India, Italy, the Netherlands, and Cuba.

Underreporting China's Grain Area: A Short History

Currently the U.S. Department of Agriculture uses China's State Statistical Bureau (SSB) as an authoritative source for data about China's grain economy. Over the last decade the SSB published a large quantity of data which greatly benefitted U.S. analyst's knowledge of the structure and functioning of China's rural economy (4). On the whole, SSB statistical workers have done a commendable job of collecting data from a periodic reporting system and from their sample survey system. The following analysis is not intended to be critical of SSB work but is included to explain to U.S. readers the limitations on data regarding China's grain area, yield, and production.

China has a long history of underreporting area sown to grain crops. In the Ming (1386-1644) and Qing (1644-1911) Dynasties, farmers and local officials colluded to remove land from tax registers to reduce the effective tax burdens on peasants. An important incentive for gentry families to educate their sons was the hope that these young scholars would pass the civil service examination, be named as a local magistrate, and then help the family remove land from the tax rolls!

At the end of the Qing Dynasty, underreported land in mainland China "stayed off of" the tax rolls when the Republic of China was formed in 1911. The People's Republic of China (established in 1949) implemented a thorough land reform in the late 1940's and early 1950's. Was the previously underreported land registered in government documents during this land reform? Currently there is no definitive answer to this question. There are reports, however, that during the reform some townships confiscated land from rich peasants and landlords which had not been on the tax rolls. This unreported land was then allocated to poor farmers to cultivate but the area continued to be unreported (2).

During the radical transformation of China's agricultural economy, as production shifted from individual farms to agricultural producer cooperatives (1953-57) and later to the rural people's communes (1958-1983), there was an administrative opportunity to register all cultivated land. On the other hand, there were also incentives for collective farms and communes to underreport cultivated land. If less land was reported, then government purchase stations would purchase less grain, cotton, and oilseed crops, fewer taxes would be paid,

and more of the product would be retained for consumption within the unit. There is evidence that in some areas the unreported land dispersed to farmers during land reform became part of the land farmed by peasants in collective farms and communes, but as late as 1980 these entities also continued not to report this land (2).

Underreporting of cultivated land area also results from the fact that different areas in China have used different units to measure land surface area. For example, to make taxes more equitable among farmers cultivating various qualities of land, some areas assigned 1 mu (1/15th of a hectare or 667 square meters) to farmers cultivating rich soil. For farmers cultivating poorer soils, they registered 1 mu of land on tax rolls for every 2 mu of land actually farmed. This practice made it difficult to analyze acreage trends in Ming and Qing times (3). In 1990 officials in one province reported that farmers in an area of intensely cultivated plains used 667 square meters to report 1 mu of cultivated area while farmers in hilly and mountainous areas used 900 square meters to report 1 mu (1).

Furthermore China's statistical officials report that the transition from the old commune system to the household land contract system has had a negative effect on the quality of grain statistics. During the commune period, basic records were kept on sown area and production of various grain crops. Commune statistical workers and accountants used these records to enter data in periodic statistical schedules. After cultivated land was contracted out to individual farm families, village and township cadres failed to keep basic records on grain area and production. Now, when these cadres are called on to fill out the periodic report forms, they have to rely more on estimates (1). This problem is especially critical in making grain production forecasts. SSB analysts use sample surveys to determine grain yields, but then they have to use flawed area estimates to forecast grain production.

Interviews with a wide spectrum of agricultural, commercial, and statistical personnel throughout the 1980's reveals that officials are aware of the problems with their grain statistics (1). One official working in northern China noted that he thought cultivated area there was underreported by about 20 percent. He thought that underreporting was worse in the north than in the south. But while visiting officials in south China, they also reported that cultivated area was underreported, especially in hilly and mountainous areas. Another official noted that underreporting varied by crop and that the area sown to feed grains (including sweet potatoes) was most affected.

Prospects for Revised Grain Statistics

First, it is important to note that if any revisions are made, they will have to be undertaken by persons in China. The task would be very difficult, if not impossible, for foreign analysts to complete.

Second, there are relatively few statistical workers in China, compared with the demand for statistical work. This scarcity of personnel, coupled with ongoing pressures to provide data for current use, will probably mean that revising the historical grain series will not be undertaken soon. One overworked analyst reported that officials in the Ministry of Agriculture understood

the serious nature of the underreporting of grain area and production, especially since 1985, but with a haggard look said it would take an enormous effort to go back and make the revisions. "How would we do it?" he asked.

Underreporting: What Are Some Implications?

First, underreporting of cultivated and sown area probably means that yields or production for some crops (minor grain crops, oilseeds, and other economic crops) are actually lower than published in official statistical yearbooks. China's crop yields from a world perspective are quite high, but China's farmers can still attain some additional yield gains. In the future increased yields could affect domestic supply balances which, in turn, could affect import and export markets.

Second, the underreporting of grain area probably means that grain production is actually greater than reported in statistical yearbooks. The State Statistical Bureau currently uses sample survey cutting teams to estimate yields for major grain crops (wheat, rice, and corn). Statistical workers multiply the yield results from sample surveys by the estimated area to estimate production. If China's leaders revise their grain production series, Grain Bureau officials will adjust their grain supply-and-use balance sheets, and China's foreign trade corporation (CEROIL) officials may make compensating adjustments in future grain imports and exports.

Third, China's agricultural authorities are pleased with the fact that there is more cultivated land than is registered in land record books. But this news does not offset China's very serious land/population ratio. For example in 1990 cultivated land was estimated at 95.6 million hectares. With a population of 1.118 billion, per capita availability was 855 square meters (0.0855 hectares or 0.21 acres). If one assumes that actual area was 20 percent more than registered in 1990, then per capita availability was only raised to 1,025 square meters (0.1025 hectares or 0.25 acres).

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References

1. Crook, Frederick W. "1990 China Trip Report: Heilongjiang, Jilin, Liaoning, and Sichuan," U.S. Department of Agriculture, Foreign Agriculture Service, Washington, DC, November 1990.
2. Endicott, Stephen. *Red Earth: Revolution in a Sichuan Village*. New Amsterdam Books, New York, 1988.
3. Perkins, Dwight H. *Agricultural Development in China, 1368-1968*. Aldine Publishing Company, Chicago, 1969.
4. State Statistical Bureau, Editorial Office. *China Statistical Yearbook, 1986*. Beijing, Zhongguo Tongji Chubanshe, Oct. 1986, p. 675.
5. U.S. Department of Agriculture, FAS, Beijing Agricultural Office, "Annual Grain and Feed Report," February 6, 1991.

Oilseeds

Oilseed Production Increased in 1990

In 1990, favorable weather and a reliable supply of inputs--particularly fertilizer--contributed to reversing the trend of declining oilseed production since 1985's record production. Total production of oilseeds (excluding soybeans, and cottonseed) increased 18 percent to about 15.9 million tons in 1990, compared to 1989's drought-reduced production. Soybean and cottonseed production in 1990 also increased about 11 and 18 percent, respectively. The production of oilseeds (including soybeans, peanuts, rapeseed, cottonseed, sunflowerseed, sesame, and other oilseeds) in 1990 increased about 16 percent to 34.9 million tons. This sizable gain in production was achieved with only a 1-percent increase in total area.

The production of rapeseed in 1990 had the most significant increase of all of the oilseeds. Favorable weather, combined with a 10-percent increase in area, contributed to an increase of about 28 percent in rapeseed production in 1990 from 1989. Most of the 1990 expansion in rapeseed area came from winter fallow land in the southern and central provinces. With relatively higher returns, rapeseed is increasingly becoming a favorite crop to grow in the spring as well.

Cottonseed production in 1990 enjoyed an increase of about 18 percent, as compared with the previous year, to around 7.6 million tons. Cottonseed production in 1990 also benefitted from favorable weather, a reliable supply of chemicals, and a 6-percent rise in area due to an increase in wheat and cotton intercropping.

With the losses suffered from the 1989 drought, peasants shied away from planting soybeans because they believe that soybeans are less drought tolerant than corn. However, despite the 7-percent decline in soybean area, production increased 11 percent in 1990 to 11.4 million tons.

Sunflowerseed area also decreased, falling 2 percent in 1990. However, output rose 13 percent to 1.2 million tons. Peanut output in 1990 increased 11 percent to 6 million tons with an increase in area of only about 1 percent (appendix table 3).

Oilseeds Exports Rose in 1990

Oilseed stock may have been running low in the last few years because production has fallen below the 1985 level. Drought-reduced output in 1989 further lessened the supply available for export in 1990. Increases in oilseed exports were small in 1990 compared to the 16-percent increase in oilseed production. This was because some of the gain in output was used to replenish stocks. Population growth and increases in per capita income continue to add pressure for expanded crushing of oilseeds to produce edible oils for human consumption and meals for feed. The transition of trade in the Soviet Union and East European countries from barter terms to a cash or credit basis has contributed to the decrease in oilseed product exports to these countries.

Peanut exports increased in 1990. Unlike other oilseeds used mainly for crushing for oils, only about half of peanut production is used for crushing. In the last decade, China has remained as one of the biggest exporters of peanuts for direct consumption. Therefore, the portion of peanuts used for direct consumption (about 50 percent of production) is much more sensitive to international market conditions. With decreases in production in major peanut-producing countries and an increase in peanut production in China, 1990 peanut exports are estimated to increase about 29 percent from the previous year to 425,000 tons.

China's 1990 cottonseed exports recovered from the 1990 decline, rising to about 40,000 tons. This was an increase of 42 percent from 1989, but is still short of the 48,000 tons exported in 1988. Although only about 38 percent of soybean production is currently used for crushing for meal, the desire to increase and improve protein content in feed mixes will continue to stimulate the feed demand for soybeans in China. Despite an 11-percent increase in soybean production in 1990, soybean exports are expected to decline about 14 percent, to just under 1 million tons. All other oilseed exports are estimated to remain about the same as in 1989, despite the large 1990 increase in output.

Oil Imports Down and Meal Exports Up Slightly in 1990

The decrease in oilseed production in 1989 contributed to an increase of about 31 percent (2.3 million tons) in edible oil imports in 1990. To improve its foreign exchange earnings and to narrow the "official" and "market" rates in the Shanghai exchange center, China's yuan was devalued in December 1989 from 1 US\$ for 3.72 yuan to 4.72 yuan. Without this 22-percent devaluation of the yuan, imports of edible oils probably would have increased by an even greater magnitude.

Contrary to what would be expected following the increase in oilseed production, meal exports are expected to remain about the same as in 1989, or even fall slightly. In addition, the policy change that returns oilseed byproducts to peasants has reduced the supply of meal for export by the government.

1991 Oilseed Production Likely To Remain High

Area in China planted to oilseeds is expected to increase in 1991. Record production there in 1990 had reduced market prices. China's Government procures about 75 percent of oilseed production and about one-third of grain production. Grain prices in the open markets and government-negotiated prices, therefore, would be affected by grain demand and supply conditions. During the bumper crops of 1990, grain prices decreased faster than the oilseed price in the open markets, an average of 16 percent for grains compared to 9 percent for oilseeds. Rapeseed area is expected to increase about 9 percent at the expense of winter fallow land and other crops planted in the spring. Peanut area is also expected to expand about 2 percent because of relatively higher returns and foreign exchange earnings from exports. Cotton area is expected to increase due to an increase in intercropping and late cotton planting. Assuming normal weather conditions in 1991, oilseed output (including soybeans and cottonseed) will

remain about the same as, or not much higher than, in 1990.

China's Government initiated a policy change in May 1991 to reduce urban subsidies on staple goods. Prices of edible oils were raised an average of 158 percent, while grain prices were raised an average of 54 percent. These price increases will cause relatively higher edible oil prices in the urban markets and encourage peasants to increase oilseed production and lower grain production. Area planted to oilseeds will likely increase this fall and over the next several years.

Oilseed, Oil, and Meal Trade Likely To Decline in 1991

Oilseed exports will likely decline in 1991 due to increased domestic crush demand for edible oils and feed. The relatively greater increases in edible oil prices in urban markets is an incentive to supply more edible oils to these markets. In addition, the decrease in barter trade in favor of cash trade with former Soviet bloc countries (Eastern Europe and Cuba) will reduce oilseed exports to these countries, especially soybean exports.

Due to increased domestic production in 1990 and stagnant oilseed exports, imports of edible oils fell in first few months of 1991. China's Government also raised import duties on all vegetable oils, except for cottonseed oil (table 7). The increase in the import tariff, along with further devaluation of the yuan (to 5.2 yuan for U.S. \$1) in November 1991, will act to discourage imports of edible oil.

Table 7--China's vegetable oil import tariffs

	<u>Minimum</u>		<u>General</u>	
	Old	New ¹	Old	New
Percent				
Soybean	6	20	11	30
Peanut	6	15	11	20
Sesame	9	15	14	20
Rapeseed	9	25	14	35
Linseed	50	20	70	30
Palm	20	30	30	40
Palm kernel	20	30	30	40
Coconut	20	30	30	40

¹ New rates effective as of November 1, 1990.

Source: China Customs Tariff Commission.

The rapidly expanding livestock and aquatic sectors continue to soak up the larger supply of meal as a result of increased domestic crushing of oilseeds. Meal exports are expected to decline in 1991, despite an increase in production. The most important factor is on the demand side. Fast-paced growth in the meat sector continues to apply pressure for increasing meal availability for domestic feed uses. The elimination of export subsidies at the beginning of 1991 will make exports of meals unprofitable for some trading companies. The possible loss of

barter markets in East European countries and high domestic meal prices will contribute to the decrease in meal exports. China's Government also allowed peasants to keep more byproducts from oilseeds turned in for crushing. This will reduce the amount available for export by the government.

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References

1. Agricultural Counselor, American Embassy Beijing, Foreign Agricultural Service, U.S. Department of Agriculture, Washington, D.C., Report Number CH1012, March 1, 1991.
2. Colby, Hunter, "Declining U.S. Agricultural Exports to China and Recent Changes in China's Trade Policy," *CPE Agriculture Report*, Vol IV, No.1, January/February 1991, Economic Research Service, U.S. Department of Agriculture.

Cotton

China's 1990 cotton production was significantly higher than most early estimates indicated. The 1990 Statistics Abstract reported that output reached 4.508 million tons, an increase of 19 percent from 1989. Area in 1990 was up about 6.3 percent from 1989, to approximately 5.53 million hectares, compared to only 5.2 million the previous year.

Cotton area increased in 1990 because of a substantial increase in its procurement price and additional, subsidized inputs allocated for growing cotton. The state procurement price for standard grade cotton increased from 4.73 yuan per kilogram to about 6. Use of plastic sheeting allowed expansion into areas that were traditionally considered unsuitable for growing cotton, while intercropping of wheat and cotton continued to expand. A number of provincial governments supplemented central government input allocations with additional, subsidized quantities of fertilizer, diesel fuel, pesticides, and plastic sheeting. A few provinces even offered a procurement price supplement of about 10 percent of the state-set price.

Cotton production in 1990 was higher than most analysts had anticipated, in part because of the unseasonably mild weather conditions throughout the fall in most areas. Only Shandong and Jiangsu Provinces experienced weather-related reductions in output due to rain and typhoon damage.

In addition, some of the increase in reported production may actually have been carryover from the previous year's harvest. Anticipating the September 1990 introduction of a 27-percent increase in the cotton procurement price, some cotton farmers likely withheld a small portion of the 1989/90 crop in order to sell it in 1990/91 and take advantage of the higher price (see *1990 China Agriculture and Trade Report*, "Cotton Outlook").

Based on China's official *1991 Statistics Summary*, every major cotton-producing province except Shandong and Jiangsu experienced an increase in 1990 output (table 8). Over 24 percent (174,000 tons) of the total 720,000-ton increase in cotton production occurred in Xinjiang, and the provinces in

Table 8--Cotton production, selected provinces, 1987-1990¹

Province	1987	1988	1989	1990
1,000 tons				
Shandong	1,244	1,137	1,025	975
Henan	570	637	527	676
Hebei	626	577	536	571
Hubei	439	362	313	517
Xinjiang	280	278	295	469
Jiangsu	444	562	485	464
Anhui	186	206	170	236
Hunan	56	44	67	120
Sichuan	102	88	85	115
Shanxi	78	87	102	112

¹ Calendar year data.

Sources: 1988-90 Agriculture Yearbooks and 1991 Statistics Abstract.

the central region (Hubei, Hunan and Jiangxi) together contributed 37 percent (264,000) tons to the total gain in output.

Cotton Trade in 1990/91

Through March of 1991, China's marketing year cotton imports were 5.6 percent higher than in the same period of 1989/90. Assuming similar trends through July, the final marketing year import figure may be slightly higher than the 408,000 tons purchased in the last marketing year. This is in spite of a number of major and minor yuan devaluations in 1989 and 1990, slack demand for yarn and cotton cloth, and a significant increase in output in 1990. Although it is conceivable that import demand may decline towards the end of the marketing year, it is more likely that low stocks and the improved competitiveness of imported cotton against domestic supplies will keep imports about the same as, or slightly above, last year.

The gap between the prices of imported and domestically produced cotton closed substantially in September 1990 when prices paid by mills for domestic cotton rose approximately 27 percent. In effect, this made the government's 1990 procurement price increase essentially revenue neutral. The competitiveness of the domestic and international textile markets, however, prevents the mills from simply raising prices and passing the higher cost on to their customers.

For exports, 1990/91 (August-March) shipments are 110,588 tons, up 7.3 percent from the same period in 1989/90. As with imports, the pace is relatively close to the previous year, and the annual total should end up only slightly higher than the 188,000 tons in 1989/90. Unlike the pressures to decrease imports, there is not a corresponding pressure to increase exports, principally because of what are thought to be low stock levels due to several consecutive years of relatively small harvests, and because of reduced demand from Eastern Europe and the Soviet Union resulting from their own economic

problems and the change to cash rather than barter trade regimes.

Forecast for 1991/92

Although the 1990 harvest was unexpectedly high, it appears that the 1991 harvest will likely be even larger. An early survey of farmer's planting intentions published in China's press indicated total cotton area may reach 6.6 million hectares, an increase of about a million hectares from 1990. Although this figure seems a little too hopeful, it does seem likely that there will be a significant increase in area, perhaps as much as 500,000 or 600,000 hectares above 1990. Assuming moderate weather patterns, 1991 cotton production should also increase. A yield of 800-805 kilograms per hectare and area of about 6.1 million hectares implies a production figure of about 4.9 million tons, up nearly 9 percent from 1990.

Although no procurement price increase appears likely for the 1991 crop, cotton will still be profitable, given the declines in grain prices following the bumper 1990 grain harvest.

The same incentives that contributed to the increased area and production in 1990/91 will remain in place for 1991/92. This includes the standard central government input subsidy program, the additional input subsidies, or even provincial price supplements, and continued administrative pressures to expand cotton/wheat intercropping. The spread of improved cotton varieties with greater disease and insect resistance, as well as improved yields, will also continue.

Cotton trade in marketing year 1991/92 will change, though not dramatically, from the 1990/91 scenario. Imports may fall due to the successful 1990 harvest and another good harvest expected in 1991. Continued devaluation of China's currency in 1991, and possibly 1992, could enhance the competitiveness of domestic cotton supplies against imported cotton, also reducing demand for imports. However, other factors affecting demand, most notably low stock levels and the demand by mills for particular specifications in cotton, will insure that though imports will decline, they will probably not drop more than 150-200,000 tons from 1990/91's 435,000 tons.

Cotton exports in marketing year 1991/92 will likely rise above 1990/91 levels, and there should also be some change in the export pattern. Cotton exports to the Soviet Union and Eastern Europe will be down due to the changeover to mostly cash trade terms. International demand for extra-long staple (ELS) cotton is low due to oversupply, so Japanese demand for China's ELS is expected to be down during 1991/92. However, closer economic and political relations with Korea may support ELS exports to Korea, making up for some of the decline in traditional markets. Overall, the expected increase in 1991/92 cotton production will support somewhat higher exports than in 1990/91, perhaps up as much as 100-150,000 tons over last year's exports of 196,000 tons.

Yarn Production Recovers

China's total yarn output in calendar year 1990 (including pure cotton yarn, blended cotton and synthetic yarn, and pure

synthetic yarn) was 4.45 million tons, a decline of 5.6 percent from 1989. January 1991 yarn production reached 402,000 tons--the first month since April 1989 that production surpassed the same month of the previous year. Total yarn production in every month from June through September 1990 was at least 5 percent lower than the same month of the previous year.

Yarn production suffered in 1990 because of a decline in domestic demand for cotton cloth and from the government's retrenchment policies. Production also slowed in response to the steep rise (about 27 percent) in the price textile mills had to pay for their cotton supplies beginning in September 1990. During the first 3 months of 1991, China's yarn production recovered to prerecession levels. And, by March 1991, output reached a record 412,600 tons, surpassing the previous 411,800-ton record set in December 1989.

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References

1. "1991 Cotton Annual Report," U.S. Department of Agriculture, FAS, Report # CH1036, June 1, 1991.
2. China's Monthly Customs Administration Statistics, various sources.

Sugar

In 1990, China saw a record year in sugar crop output and sugar production. China's sugarcane, sugarbeet and sugar production increased 18.1, 57.2 and 14 percent, respectively (table 9). Sharp increases in sugar crop procurement prices and the prices charged to end-users for refined sugar, as well as increased area, continued improvements in yields, hybrid seed, water management, and development of the sugar processing industry in new sugar production base areas (Xinjiang, Yunnan and Guangxi), all contributed to record 1990 production. China's press reported that the nation currently has a total of 540 sugar mills and factories with a daily processing capacity of 550,000 tons of raw material.

The sugar crop harvest and sugar production are expected to continue to expand in 1991, though probably not as much as last year. The official government target for the 1991 sugar crop (sugarcane and sugarbeets combined) is 1.75 million hectares of area planted and 68 million tons of output. However, these numbers were announced prior to the revised 1990 output figure of 72.1 million tons. Therefore, it seems likely that the government may revise its production target upwards, likely equal to, or slightly higher than, this year's harvest. Forecasts for 1991 sugar output may also be raised.

The record 1990 crops and sugar production have strained China's storage, distribution, and marketing systems. Additional problems have been created by large price increases for raw and refined sugar, causing some processors and end-users to have problems obtaining the additional cash needed for purchases. Reportedly this has affected 1991 planting intentions in some areas. Farmers who have not been paid or were not paid in a timely fashion because of processor cash

Table 9--China's sugar production and trade statistics¹

Item	1986	1987	1988	1989	1990
1,000 tons					
Sugar crops ²	58,525	55,503	61,874	58,038	72,145
Sugarcane	50,219	47,363	49,064	48,795	57,620
Sugarbeet	8,306	8,140	12,810	9,243	14,525
Sugar output ³	5,250	5,060	4,610	5,009	5,709
Sugar imports ⁴	1,182	1,827	3,709	1,581	1,132
Raw	1,114	1,760	3,351	1,480	959
Refined	68	66	358	100	173
Sugar exports ⁴	266	452	248	430	570
Raw	3	4	3	3	5
Refined	263	449	245	426	566

¹ Totals may not equal sum of parts due to rounding. Statistics are all "raw value." ² Data is on China's official crop year basis as supplied by China's State Statistical Bureau (SSB). ³ Data is on a calendar year basis as supplied by SSB--not official USDA numbers.

⁴ Data is on a calendar year basis as supplied by China's Customs Administration.

Sources: 1990 Statistical Yearbook, 1991 Statistics Abstract, and China's Customs Statistics.

shortages are electing to plant alternative crops. Nevertheless, procurement prices for sugar crops relative to competing crops are such that, on the whole, area planted to sugarbeets is expected to increase and area planted to sugarcane should stay about the same or even rise slightly.

Last year's bumper grain harvest, the re-emergence of promissory notes in some areas, and the substantial decline in free-market grain prices, have contributed to increased interest in sugar crops, particularly in the Northeast beet-growing region. According to a recent provincial survey of 3,136 Heilongjiang households, sugarbeet farmers intend to increase area by 62,000 hectares, an increase of nearly 14.8 percent over last year's planted area (3). With moderately good weather again this year, sugar crop production is expected to increase.

Given the long-run difficulties of competing pressures for arable land from staple crops, China will have to actively support sugar farmers and processors in order to reach its goal of self-sufficiency. Corn and soybeans compete with sugarbeet cultivation in the north, while rice and cassava compete with sugarcane cultivation in the south. Additional competition in the south comes from fruit and vegetable cultivation, which can be competitive against sugar if the locality has ready access to the booming markets in south China (particularly the Pearl River Delta region). Therefore, although continued growth in both sugar crop output and sugar production is planned throughout the coming decade, the government's task will not be an easy one.

Record sugar crops and sugar production last year should hold imports down this year. China's total sugar imports in 1990

were 1.1 million metric tons, down from 1.6 million in 1989 and 3.7 million in 1988. On the other hand, sugar exports (mostly refined sugar) increased from 430,000 tons in 1989 to 570 in 1990.

The expected increase in domestic sugar production in 1991 following the large 1990 sugar crop, healthy stocks following 2 consecutive years of successful sugar crop harvests, and tightened central control over sugar trade, suggest that imports in 1991 will be down slightly relative to 1990. Imports will be limited to purchases under official government-to-government agreements.

This analysis is currently contradicted, however, by the fact that total sugar imports during the first quarter of 1991 are over 50 percent higher than during the same period of 1990. Although the early, strong buying may fall off so that total 1991 imports are as initially forecast, it is also possible that either the recentralization of sugar import authority has not been particularly effective or that, in light of serious budgetary difficulties, the government has authorized increased sugar imports--despite healthy stocks and a bumper crop--in order to take advantage of an international sugar price that is about \$150-200 less than China's current domestic price.

China imports sugar from Cuba, Australia, Thailand, and Argentina. In 1990, approximately three-fourths of China's total sugar imports were from Cuba under government-to-government bilateral agreement. The central government reimposed control over sugar imports when domestic prices rose above international prices, preventing local or provincial governments from importing sugar without central government approval. The controls are expected to remain in place at least until 1993, effectively preventing provincial governments from entering the international market to take advantage of the lower prices.

Although China does export refined sugar, the majority is from "tolling," importing raw sugar for refining and re-exporting to utilize China's excess refining capacity as well as earn money on the price differential. The government also contracts to refine sugar on a straight fee basis. Tolling requires a certain minimum price spread to be a profitable venture. Early indications suggest that, with a somewhat lower profit margin in 1991 (because of lower international sugar prices and higher domestic refining costs), China's 1991 sugar exports will be lower than in 1990. Trade data for the first 3 months of 1991 shows exports are running at only 24 percent of the same period in 1990.

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References

1. "Light Industry Ministry Expects Bumper Sugar Crop," Beijing Xinhua in English, 04/16/91, in JPRS-CAR-91-022, 04/24/91, p. 89.
2. "China - 1991 Sugar Annual," U.S. Department of Agriculture, FAS (Guangzhou ATO), Report #CH1506, April 15, 1991.

3. "Shenyang Monthly Agricultural Report," Shenyang Consulate, U.S. Department of Agriculture, FAS, May 1991, p. 9.

Livestock and Feed

In 1990, China's livestock sector registered another year of rapid growth in both value and output terms after the bumper 1989 grain harvest. China's livestock production will continue to expand in 1991 because of another successful grain crop in 1990. Nationwide development of dairy products slowed in 1990, but the European Economic Community dairy aid project kept milk production and consumption high in 20 major cities.

Livestock Output Increased

In 1990, the value of China's livestock production increased 5.9 percent from the previous year. Red meat output, including pork, beef, and mutton, rose 7.7 percent, an increase of 1.8 million tons from 1989, reaching 25.14 million tons (appendix table 4). Pork, the bulk of China's meat outturn, continued to increase as hog slaughter totalled 310 million head. China's yearend hog inventory rose to 362 million head, a 3-percent increase from 1989.

China's hog slaughter rate improved to 87.8 percent in 1990. The 1990 rate is still fairly low compared with an average of about 150 percent reported in many developed countries. However, the latest hog slaughter rate, compared with a rate of only 62.1 percent in 1980, suggests China's farmers have made significant improvements in breeding and feeding efficiency.

China's hog production has long been characterized by farm household-level production activities, which supply about 90 percent of the country's total pork output. Central government policy in the last several of years has emphasized reducing individual farmer production activities in order to avoid rapid inventory increases because of their relatively high feed-to-pork conversion rates. Instead, the government has tried to encourage farm households to produce more poultry products or ruminant meat as a better use of feed grain and pastureland.

The continued increase in yearend hog inventory in the past few years seems to indicate that government goals will be attained later than had been originally thought. Changes in farmers' traditional livestock production activities as well as changes in consumers' tastes have been slow to be realized. Other factors, such as surplus and/or disguised labor in individual farm households, low state-fixed procurement prices for grains, and the low quantity and poor quality of manufactured feed (see special article on feed development in recent years), might also have contributed to the continued expansion of hog-raising activities in rural areas.

Other livestock production also increased in 1990. Growth of poultry and cow's milk output was still significant, although the pace has slowed somewhat. Wool output increased in 1990, but China continued to import wool to support the rapid

development of its textile industry. China will continue to import wool in 1991, but imports will not increase greatly because they were reportedly overstocked in 1990. The share of wool imports from Australia will likely increase, as the Australian Government announced a 30-percent reduction in its export prices in early 1991.

Continuous Expansion Again in 1991

China's 1990 bumper grain harvest, particularly corn, will aid in the production of meat and dairy products according to officials of the Ministry of Agriculture's Animal Husbandry Bureau. The total production value of livestock is planned to be 78.7 billion yuan, compared with a 1990 value of 75.6 billion yuan. A bumper grain harvest in 1990, especially a good harvest of corn, will increase feed supplies and facilitate increased meat output this year. To support quality meat production, the central government announced that it will continue to subsidize prices for 3 million tons of grain used as feed and to allocate special funds for lean pork production bases.

According to the latest Ministry of Agriculture statistics for the first 3 months of 1991, a total of 96.6 million pigs were taken to market, an increase of 7.3 percent over the same period last year. Output of red meat during the first quarter was 7.4 million tons, an increase of 8.9 percent over first-quarter 1990.

The target of total meat production for 1991 is an increase of about 700,000 tons. The plan for milk production is 5 million tons, compared with 4.7 million tons in 1990. Wool production will rise to about 249,000 tons in 1991, up from 240,000 tons in 1990.

EC Dairy Aid Continues

The European Economic Community (EC) dairy aid project, which began 3 years ago, is in mid-stage. After EC officials' evaluated the milk aid project early this year, they decided to continue delivering skimmed milk powder and butter to 20 of China's major cities in 1991 and 1992. The 20 cities include Shenyang, Dalian, Qingdao, Beijing, Tianjin, Wuhan, Hefei, Nanjing, Shanghai, Wuxi, Suzhou, Xian, Chongqing, Changsha, Chengdu, Gulin, Hangzhou, Nanchang, Guangzhou, and Fuzhou.

So far, the EC program has provided the 20 cities with 28,000 tons of skimmed milk powder and 11,050 tons of butter. The money (about 175 million yuan) earned from selling the EC's milk powder and butter and the dairy products made from those supplies has been invested in the Chinese dairy industry in order to improve milk production. Annual milk output in the 20 cities reached 1.05 million tons in 1990, an increase of 11.6 percent from the previous year. In these cities, per capita milk consumption reached 21.4 kilograms in 1990, a figure 500 percent higher than the country's annual average per capita milk consumption.

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U.S.-China Agricultural Trade Over Two Decades

Francis C. Tuan*

Abstract: Total U.S.-China trade has expanded rapidly since 1972. Agricultural trade between the two countries also grew significantly in the last two decades, although not as steadily as overall trade. The agricultural trade balance has been generally in favor of the United States. The trade values fluctuated in the 1980's, mainly caused by unstable U.S. agricultural exports. The fluctuation of exports to China can be largely attributed to the low priority China has assigned agricultural imports, availability of foreign exchange, annual grain production levels, and trade disputes between the two countries.

U.S. agricultural exports to China in 1991 will drop because China's 1990 record grain crop reduced the demand for imported grains. Future U.S.-China agricultural trade is expected to gradually increase, but continue to fluctuate as in the 1980's. If China continues its reform program, its limited arable land, together with population growth and income increases, suggest that China will need to import more grain, particularly wheat. China's increasing demand for imported grain, especially from the United States, will hinge on whether the United States continues granting China most-favored-nation status.

Keywords: United States, China, agricultural trade, imports, exports, trade policy, trade prospects, trade statistics.

Since the normalization of economic relations in 1972, trade between the United States and China has made substantial progress. Although the pace of the development slowed significantly during the 1980's, it was still much faster than that of world trade after both countries signed a trade agreement in 1979, the year the United States and China established diplomatic relations. The two-way trade between the two countries was in favor of the United States until 1982, then it turned in China's favor. Since 1989, according to U.S. Census Bureau statistics, the United States has not only become China's number one trading partner, but China's trade surplus with the United States has risen sharply, from a total of \$55 million in 1985 to \$10.4 billion in 1990. China has become the third largest trade-surplus nation with the United States, behind only Japan and Taiwan.

The development of U.S.-China agricultural trade has also been significant, though growth has not been as steady as that of overall trade. In contrast to total trade, agricultural trade between the two countries has been generally in favor of the United States, with a growing, but lower, level of U.S. imports and a fluctuating, but often much higher, level of U.S. exports. The fluctuations in U.S. agricultural exports to China can be attributed mainly to the low priority China assigned agricultural imports, changes in China's annual agricultural production levels (especially wheat, corn, soybeans, and cotton), China's hard currency reserves, the country's trade reforms and policy changes, and trade disputes between the two countries.

Provided the United States continues to grant China most-favored-nation status, total U.S.-China agricultural trade is expected to gradually increase in the 1990's. With limited arable land and growth in both population and income, China's demand for imported grain from all sources, including the United States, will gradually rise. Therefore, China's demand

for imported grain, particularly wheat and possibly feedgrain, will increase towards the end of the century. However, for the same reasons as mentioned earlier, the total value of U.S.-China agricultural trade will continue to fluctuate for the next few years.

The Growth of U.S.-China Total Trade

During the 1970's, total U.S.-China trade grew sharply from only \$95 million in 1972 to \$4.9 billion in 1980, an increase of 63.5 percent a year according to statistics compiled by the U.S. Census Bureau (Note: U.S.-China trade statistics published by the U. S. Census Bureau and China's Customs Administration are significantly different, see figures A-1, A-2, and A-3, and refer to the discussion of differences in statistical compilation between the U.S. Census Bureau and China Customs Administration in the box entitled "Differences in Trade Statistics in U.S. Bureau of Census and China's Customs Administration"). Although growth slowed significantly during the 1980's, falling to 15.2 percent a year, it was still far higher than the single-digit growth rate of world trade. The value of two-way trade between the two countries reached \$20 billion in 1990.

The balance of trade was generally in favor of the United States until 1982, with a peak surplus in 1980 of \$2.8 billion. However, in 1983, total trade began to turn in China's favor because of surging exports of manufactured goods, particularly textile products. Since then, China's trade surplus with the United States has increased sharply, from \$71 million in 1983 to \$10.4 billion in 1990. The United States became China's number one trading partner in 1989 and, in 1990, China had the third largest trade surplus with the United States.

The most recent trade statistics for the first quarter of 1991 revealed that China's trade surplus with the United States was still growing. By the end of this year, China's trade surplus may approach \$15 billion and China could become the second largest trade-surplus nation with the United States. This rising

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Figure A-1
U.S. Exports to China

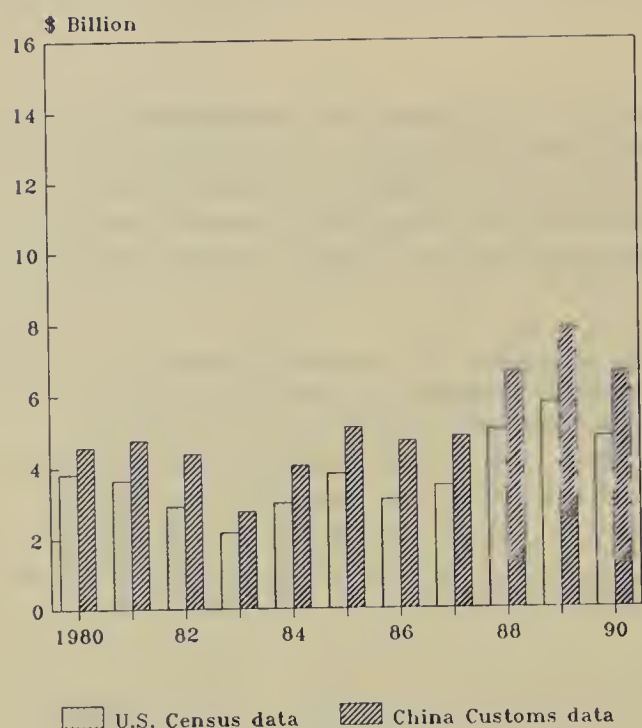
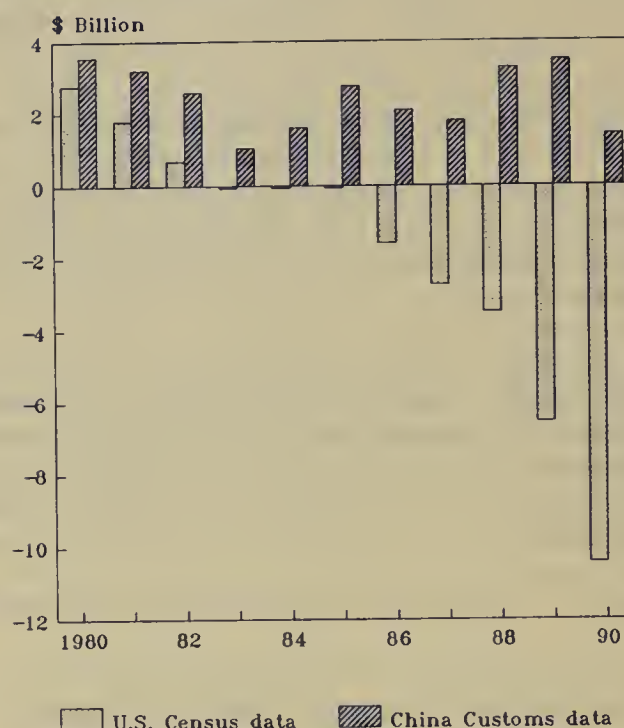


Figure A-3
Balance of Trade



trade imbalance will continue to be a trade dispute between the two countries.

The Development of U.S-China Agricultural Trade

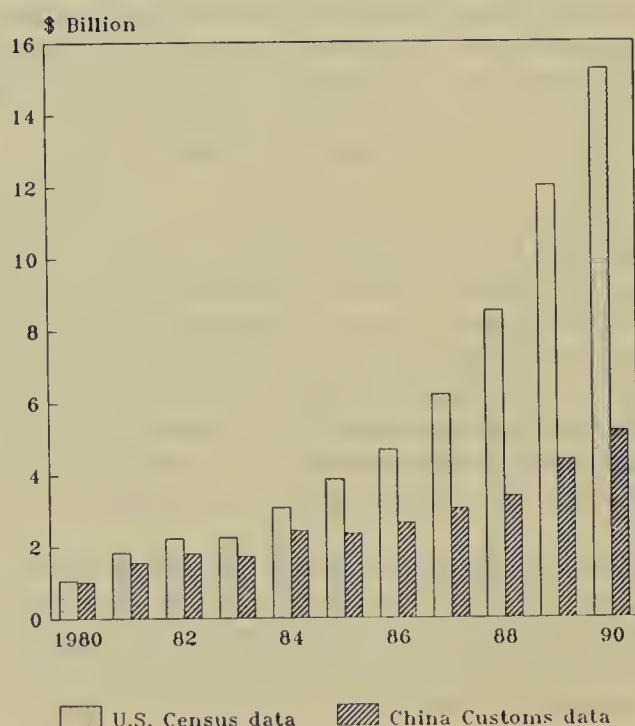
Like total trade, agricultural trade between the United States and China also expanded very rapidly during the 1972-80 period, averaging 53.5 percent per year. In 1980, the total

value of two-way agricultural trade peaked at \$2.4 billion. However, U.S. agricultural trade with China declined in 1981 and has since fluctuated significantly. The decline ended in 1986 when China's wheat imports from the United States were at their lowest point. Trade picked up again after 1986, because China's grain production stagnated and because the U.S. Export Enhancement Program (EEP) targeted China with discounted wheat to counter the EC's subsidized wheat sales to China. In the late 1980's, U.S. wheat exports to China increased and contributed as much as 80 percent of the total value of U.S. agricultural exports with China.

Nevertheless, the value of 1990 agricultural trade dropped again to \$1 billion, down 38 percent from the previous year and 55 percent below that of 1980. The drop in U.S. wheat exports, more than offsetting increases in cotton and other exports, was due to China's record 1989 and 1990 grain crops.

In general, U.S.-China agricultural trade has been in favor of the United States except for 2 years in the 1970's (1976 and 1977) and another 2 years in the 1980's (1985 and 1986). In 1972, the U.S. agricultural trade surplus with China was \$47 million, with \$63 million of exports and \$16 million of imports. Two-way agricultural trade grew rapidly, surpassing \$1 billion for the first time in 1979. In 1980, the total value of U.S.-China agricultural trade peaked at \$2.4 billion, and the U.S. agricultural trade surplus with China peaked at \$2.1 billion. Since that period, agricultural trade between the United States and China has not returned to 1980's record level. In 1990, the U.S. agricultural trade surplus shrank to \$543 million.

Figure A-2
U.S. Imports From China



The Composition of U.S. Agricultural Imports

The value of U.S. agricultural imports from China grew markedly and steadily between 1972 and 1980, from a total of

\$16 million to \$133 million, an increase of more than 30 percent a year. The growth rate slowed significantly to only about 7 percent annually in the 1980's, with an import value totalling \$271 million in 1990. The 1990 value, however, was almost 15 percent below the previous year's record of \$319 million (table A-1).

The Chinese agricultural products imported by the United States mainly consist of poultry products (mostly feathers and down), vegetables (mainly canned mushrooms), tea, and essential oils (such as citronella, spearmint, peppermint, eucalyptus, and sassafras).

In the vegetable category, the value of China's canned mushrooms exports grew rapidly from 1980 to 1989 and contributed approximately 18.5 percent of China's total agricultural exports to the United States in 1989. However, the value of China's 1990 canned mushrooms imports dropped sharply below the 1980 level because the United States banned some products due to contamination problems. The ban on Chinese canned-mushroom imports was recently lifted by the U.S. Government. It is expected that these imports will resume growth in 1991.

U.S. imports of Chinese beverages (including tea) increased to a total value of \$42.1 million in 1990, an increase of 12.7 percent a year over the last decade. U.S. imports of other products in the beverage category, such as cocoa and beer, have also increased steadily in the 1980's. Chinese beverage exports contributed 15.5 percent of China's total agricultural exports to the United States in 1990.

The Composition of U.S. Agricultural Exports

The value of U.S. agricultural exports to China has increased much faster than the value of imports from China. The annual growth rate of U.S. export values averaged 57.2 percent from 1972 to 1980 and peaked in 1980 at \$2.3 billion. Since 1981, U.S. agricultural exports to China fluctuated and, in 1990, the export value shrank to \$814 million, 55 percent below 1980's record level (table A-2).

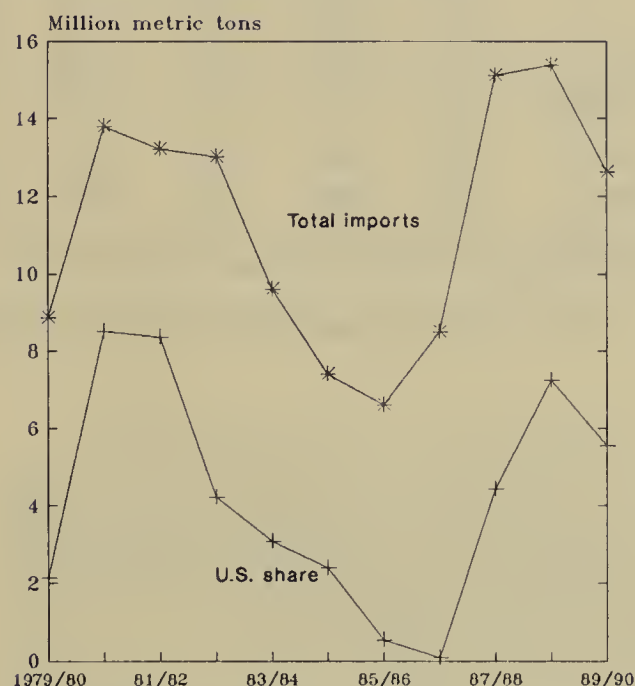
Major U.S. agricultural exports to China over the last two decades include wheat, corn, cotton, soybeans and soybean oil, tobacco, and cattle hides. China became a major U.S. grain importer, particularly of wheat, since the two countries established economic relations in 1972. With a long-term grain agreement between the United States and China from 1980 to 1984 for 6-8 million tons (15-20 percent corn) a year, U.S. grain exports to China were low only in the mid-1970's and mid-1980's.

A major reason for the low shipments of grain to China during a 4-year period beginning in 1983 was the United States and China's dispute over a textile agreement in 1983. When the United States decided to restrict China's rapidly growing textile product exports to the United States, China retaliated by limiting imports of U.S. grains. Although the two countries reached a textile agreement in 1984, China did not resume imports of grain from the United States. China's record grain harvests in 1984 and its government leaders' decision to reduce the country's reliance on imported grain were two major

reasons higher levels of grain imports did not resume until 1987.

Despite China's increasing sensitivity to commodity prices in the international market in the 1980's, closely examining the levels of China's wheat imports from the United States with that of all other sources, one can conclude that the United States had only been a residual wheat supplier to China in the past decade. Figure 4 indicates that China continually imported 7-8 million tons of wheat every year from other sources, mainly Canada and Australia, in the past 10 years, and then purchased the residual of its needs from the United States. This observation holds even U.S. wheat sales to China were with EEP bonuses during the last 3 or 4 years.

Figure A-4
U.S. Share of China's Wheat Imports



China was once a major market for U.S. corn, soybean, and cotton exports. Since its economic reforms began in 1979, China gradually became self-sufficient in cotton, corn, and soybean supplies. In some years in the 1980's, particularly the years following China's record grain and cotton output in 1984, China even exported significant quantities of corn, soybeans, and cotton, competing with the United States in some Asian markets.

China is often a price taker when exporting its agricultural commodities in international markets. By setting prices lower than those in international markets, China could sell its agricultural products to Asian countries because of its geographical advantage.

U.S. agricultural exports to China during the 1970's and the early 1980's contributed an important part of the total value of U.S.-China total trade. Beginning in 1983, the importance of U.S. agricultural exports to China has gradually declined

Table A-1--U.S. agricultural imports from China, 1980-90¹

Item	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Million U.S. \$											
Meat	0.9	0.8	1.0	1.0	1.0	0.7	-	1.3	0.4	0.3	0.1
Poultry and products	24.4	24.7	11.5	8.3	12.4	15.7	23.3	35.5	31.7	40.4	39.4
Hides and skin	0.9	0.7	0.8	1.1	0.9	1.1	0.9	0.9	3.6	-	0.8
Wool	4.3	5.9	4.4	4.2	4.0	3.8	2.1	3.6	4.6	3.5	1.5
Silk	4.3	6.8	5.7	5.1	4.5	3.4	3.1	4.3	4.7	11.1	7.5
Grain and feeds	2.8	3.4	3.4	3.9	4.5	4.7	4.0	5.0	5.1	8.1	7.0
Fruits	2.3	3.3	5.9	6.5	5.5	4.1	4.4	7.4	10.2	8.2	6.9
Nuts	1.7	1.9	2.1	5.8	8.2	7.8	7.2	7.4	6.8	10.9	7.7
Vegetables	20.2	36.5	46.2	18.8	57.8	56.5	53.1	68.8	83.4	97.9	60.3
Mushrooms, canned	13.5	22.9	28.0	28.0	37.9	37.6	31.0	41.4	48.5	58.9	10.7
Beverages	11.3	14.1	30.1	22.5	30.9	42.0	39.7	35.7	44.7	37.5	42.1
Cocoa	0.2	1.7	14.0	7.9	8.7	15.2	10.3	6.3	14.0	8.5	11.6
Tea	9.9	10.7	10.0	9.9	18.3	18.3	16.5	14.2	20.2	21.7	23.4
Oilseeds	2.1	153.4	2.3	7.9	4.7	2.7	3.7	4.2	6.9	4.0	3.2
Essential oils	13.3	9.9	12.0	13.9	12.9	13.3	13.4	13.8	19.3	13.9	16.8
Drugs, crude natural	13.6	5.0	12.8	8.3	6.2	6.4	4.6	7.3	8.5	10.1	15.1
Total agriculture	133	299	170	143	191	197	204	237	279	319	271
Total imports	1,042	1,830	2,216	2,244	3,065	3,863	4,672	6,195	8,510	11,990	15,224

¹ -- = negligible; imports for consumption, customs-value basis.

Source: U.S. Department of Commerce, Bureau of the Census, various years.

because of rapid growth in U.S. nonagricultural product exports. Meanwhile, China's nonagricultural exports to the United States expanded even more rapidly, making U.S.-China agricultural trade to total trade progressively less important in terms of total trade value. The situation will likely continue unless China substantially increases its demand for imported U.S. agricultural grains, particularly wheat.

Outlook for 1991 U.S.-China Agricultural Trade

Faced with mounting net grain imports in 1988 and 1989 because of 4 consecutive years of stagnated grain production, China's Government was determined to boost output. In 1989, China's central government began to increase agricultural investment and encouraged provincial governments to set aside funds to build agricultural capital.

To encourage farmers to grow more grains and to offset high inflation, the government also raised procurement prices nearly 20 percent. In addition, China's Government recentralized input distribution to ensure that fertilizer allocated to grain production actually reached farm households. Moreover, China's leaders again began using administrative fiat, primarily through the Party, to force farmers to grow more grain. All these measures, coinciding with excellent weather, resulted in record grain outputs of 408 million and 435 million tons in 1989 and 1990, respectively.

The record crops have altered China's grain trade since the end of 1990, mainly by reducing its wheat imports and by increasing its corn exports to neighboring Asian countries, noticeably

Japan and South Korea. As a result, U.S. wheat exports to China, which contributed as much as 80 percent of total agricultural trade in recent years, will be significantly lower in 1991. It is likely that the U.S. share of China's wheat imports may drop from nearly 50 percent in 1988 or 1989 to only about 30 to 35 percent this year. Furthermore, China has not only stopped buying corn from the United States in 1991, but also began aggressively exporting more corn, taking some of the U.S. market share in Japan and South Korea.

U.S. cotton exports to China fluctuated in the 1970's and peaked in 1980. Exports have declined since 1981 and were negligible between 1983 and 1988 because of the tremendous surge in Chinese cotton output during 1983-84. Faced with large cotton stocks, China decided to export cotton to certain Asian markets and it has become a major cotton exporting country since the mid-1980's. However, China's success in promoting cotton exports, unexpected increases in domestic demand for raw cotton (due to rapid development of the textile industry), and stagnating cotton production during the second half of the 1980's, forced China to resume imports of U.S. cotton in 1989 (table A-2). However, China is not expected to continue to purchase U.S. cotton throughout the 1990's. China is currently encouraging farmers to grow more cotton by increasing area. China will basically aim to produce enough for long-term self-sufficiency.

Overall, U.S.-China agricultural trade in 1991 will likely drop below \$1 billion, with U.S. exports to China remaining quite low. This is mainly because of depressed wheat prices and lower quantities of U.S. wheat being exported to China.

Table A-2--U.S. agricultural exports to China, 1980-90¹

Item	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1,000 tons											
Wheat	6,369	7,617	6,870	2,458	4,067	816	0	1,916	6,592	7,401	3,692
Corn	1,667	468	1,591	1,356	0	0	56	1,251	0	302	140
Tobacco	--	--	0	0	--	--	--	0	1	0	--
Cattle hides ²	405	186	323	104	500	743	278	208	130	133	29
Soybeans	665	473	246	0	0	63	124	429	0	0	0
Cotton	463	249	117	2	2	1	--	--	20	196	183
Soybean oil	100	26	0	0	10	--	0	0	0	0	0
Million U.S. \$											
Wheat	1,088.7	1,298.3	1,053.5	377.7	576.3	105.0	0	139.2	697.8	1,108.7	497.3
Corn	224.5	62.5	189.4	158.1	0	0	4.2	94.9	0	33.5	15.0
Tobacco	0.2	--	0	0	0.9	0.7	0.7	0	3.7	0	0.9
Cattle hides	12.6	6.0	10.8	3.7	20.9	29.3	11.1	10.6	6.2	5.4	1.2
Soybeans	173.5	129.7	63.2	0	0	12.6	25.4	85.9	0	0	0
Cotton	701.3	464.0	177.8	2.3	3.5	1.6	0.3	0.2	25.2	259.1	277.2
Soybean oil	56.5	17.1	0	0	7.4	-	0	0	0	0	0
Total agriculture	2,277	1,986	1,504	544	613	157	57	362	759	1,435	814
Total exports	3,817	3,628	2,911	2,173	3,004	3,808	3,077	3,469	5,021	5,755	4,807

¹ -- = negligible. U.S. domestic exports, f.a.s.-value basis. Exports include transshipments of agricultural products through Canada.

² Numbers in thousands.

Source: U.S. Department of Commerce, Bureau of the Census, various years.

China's Future Reforms and U.S.-China Agricultural Trade

In the past 10 years, rural economic reforms and policy changes have contributed substantially to growth in the rural economy. Regional crop specialization, particularly in cotton and oilseeds, development of the livestock sector, increases in income, and amore open trade policy have led China to expand its international grain trade. Even though domestic wheat output grew more than 60 percent in the last 10 years, China has remained a leading world wheat importer. However, China's agricultural imports were generally limited by: the low priority given to imports of agricultural products (due to the limited availability of foreign exchange), China's annual grain and oilseed output, and centrally controlled trade policies (such as imposing certain import restrictions).

China has not changed its traditional policy goal of food self-sufficiency. Over the past four decades, this policy has driven provinces to develop their own food supplies. As provinces achieve a greater degree of food self-sufficiency and need a more commercialized system to trade with the outside, either domestically or internationally, the infrastructure, particularly food marketing, storage, and transportation modes, is either nonexistent or insufficient because of the lack of demand and utilization in the past (6).

Increased use of centralized controls and administrative fiat during the last several years have been costly and have probably

overemphasized grain production. For example, China's 1990 and 1991 guaranteed rice, wheat, and corn procurement prices of 1.00, 0.925, and 0.61 yuan per kilogram, respectively, equals \$192 per ton of rice, \$178 for wheat, and \$117 for corn (7). Currently, world wheat prices are only about two-thirds of China's guaranteed price (U.S. EEP wheat prices only about half of the level of China wheat price). Thus, by importing only a few more million tons of wheat from foreign sources, China's Government could save hundreds of millions of dollars. In the past, China limited grain imports because of a lack of hard currency. With growing trade surpluses, China would be better off purchasing more grain, particularly wheat, from other countries, including the United States.

China has a large population but limited arable land. Land and capital are relatively scarce resources and, in contrast, labor is an abundant resource. The returns to labor from manufacturing light industrial products or from producing high-value cash crops are much greater than those from producing major agricultural commodities such as wheat (9). China has benefitted by vigorously developing the textile industry instead of exporting large quantities of raw cotton. The development of the textile industry has helped China better utilize its labor force and has contributed significantly to increases in foreign exchange earnings needed to import agricultural commodities and advanced technology and equipment.

China is now vigorously developing other manufactured industrial products, such as electric and electronic goods, to

further utilize its abundant labor resource. If economic reforms there are to be gradually resumed and the agricultural sector is to be more productive and efficient, China will have to more efficiently utilize its labor to produce a higher return and more profitable output. This would tend to produce more light industrial products or cash crops, including vegetables, fruits, cotton, sugar, and oilseeds. The importance of grain production in China is expected to gradually decline in the future. With increased incomes and population growth, China will need to import more grain from the world market, including the United States.

U.S.-China agricultural trade is expected to gradually grow in the long run. With world trade-liberalization talks progressing at the negotiations at the General Agreement of Tariffs and Trade (GATT) meetings, China needs to deepen reforms in its trade system if it is to become a member of the GATT. China's elimination of export subsidies this year is a positive step towards further liberalizing its foreign trade. However, indirect subsidies (for example, input subsidies) on agricultural production, restrictions on foreign grain imports imposed by China's central government, the growing U.S.-China trade imbalance, and the U.S. decision to continue to grant most-favored-nation status to China will all be important factors affecting U.S.-China agricultural trade in the 1990's.

References

1. China's Customs General Administration, *China's Customs Statistics*. Economic Information & Agency, Hong Kong. Various issues.
2. _____, *Summary Surveys of China's Customs Statistics*. Knowledge Publishing House, Beijing. 1986-89 issues.
3. Chen, Nai-Ruenn, "U.S.-China Trade Discrepancies," *The China Business Review*. U.S.-China Business Council, Washington, DC, July-August 1987.
4. Ministry of Agriculture, *Encyclopedia of China's Rural Economic Statistics, 1949-86* (Chinese). Agricultural Publishing House, Beijing, May 1989.
5. Ministry of Foreign Economic Relations and Trade, "Sino-U.S. Trade Issue Clarified," *China Daily*, May 11, 1991, p. 2.
6. Tuan, Francis C., "Record Grain Crops in China," *Agricultural Outlook*, Economic Research Service, U.S. Department of Agriculture, March 1991.7. U.S. Agriculture Office, "China - Grain and Feed Annual," AGR Number: CH 1007, U.S. Embassy, Beijing, March 1991.
8. U.S. Bureau of Census, "U.S. Agricultural Exports and Imports," Country by commodity, monthly printouts, U.S. Department of Commerce.
9. Webb, Shwu-Eng H. and Tuan, Francis C., "China's Agricultural Reforms: Evaluation and Outlook," *China's Dilemmas in the 1990's: The Problems of Reforms, Modernization, and Interdependence*, Joint Economic Committee, U.S. Congress, April 1991.

Differences in Trade Statistics Between the U.S. Bureau of Census and China's Customs Administration

There are serious discrepancies between the trade statistics compiled by the U.S. Bureau of Census and China's Customs Administration (see fig. A-1, A-2, and A-3). While U.S. statistics show a continuous and rapid growth in trade deficits with China over the last 7 years, China's statistics, in contrast, still show U.S. trade surpluses. These discrepancies can be explained as follows (3):

(1). Transshipment or re-exports: Transshipment through Hong Kong is the major factor in the discrepancy, according to the U.S. Department of Commerce. U.S. statistics record imports and exports according to the country of origin and final destination of goods. But China's customs statistics generally count goods sent via Hong Kong for reshipment as originating in or bound for the city. Transshipment of Chinese exports through Hong Kong to the United States is more common than for trade in the opposite direction. In 1989, Hong Kong statistics showed that \$8.45-billion worth of goods from China were re-exported to the United States and, in 1990, the same figure soared to \$10.47 billion, accounting for nearly 69 percent of the total value of U.S. imports from China (5).

(2). Goods valuation: U.S. and Chinese trade statistics use different methods to determine the value of traded goods. U.S. trade statistics report exports in terms of f.a.s. (free alongside ship) value and import statistics in terms of customs (similar to f.o.b.). Chinese statistics report exports on an fob (free on board) basis and imports on a c.i.f. (cost, insurance, freight) basis. The major difference is therefore on the valuation of imported goods.

(3). Currency conversion, time lags, differences in statistical coverage and accounting practices, and the commodity classification system, all contribute to the U.S.-China trade statistical discrepancy. These are also common factors contributing to differences in statistics with many other trade partners.

(4). Recording system: The United States and China use different methods to record some trade items. For example, a piece of equipment leaving the United States under lease is included in U.S. export data if the contract period exceeds 1 year. When the same piece of equipment enters China, however, Chinese statistics record it in a separate category that is not included in its total imports.

As Hong Kong has become an increasingly important entry-point for China trade in the last 10 years, the impact of transshipment on the trade discrepancy between U.S. and China trade statistics had become even greater.

China's Grain Production Economy: A Review by Regions

Frederick W. Crook*

Abstract: China has begun publishing new information that allows researchers to examine China's grain economy from a regional perspective. As might be expected with most large agricultural economies which have great diversity in geography and climate, grain production growth rates in China varied considerably from one region to another. In the past three decades some regions have been grain rich and others grain poor. China's leaders organized a grain purchase and supply system to transfer grain from surplus to deficit regions. Lack of adequate transportation links between grain surplus and deficit regions, plus a penchant by local leaders to achieve grain self-sufficiency in the early 1960's helped to guide leaders in Beijing to purchase grain in international markets to meet food grain requirements for large urban centers. At that time, there were large differences between per capita grain production and consumption requirements. While production increases, especially in the 1980's, narrowed this gap, deficits continue to exist in some large urban areas. China's authorities will likely continue to purchase foreign food and feed grains to meet these requirements in the future as the internal transportation system is not likely to improve soon.

Keywords: Regional grain area, yield, production, per capita grain output, growth rates, and grain imports.

China is the world's largest producer and consumer of grains. This large grain economy has great regional diversity, however, because of differences in climate, geography, population density, and access to transport facilities.

Per capita grain production increased steadily over the last three decades from 235 kilograms in 1963 to 369 kilos in 1989, an annual-average growth rate of 1.75 percent. But within China some regions are grain poor while other regions are grain rich. Given the inadequate internal transportation system necessary to move grain from surplus to deficit regions, and acknowledging local leaders' biases to attain the goal of local grain self-sufficiency, China's leaders used international grain imports to supplement food and feed requirements to large urban centers in deficit regions. U.S. firms have participated in this trade, shipping millions of tons of grain (wheat, corn and soybeans) in selected years.

During the reform period (1979 through 1989), China's seven regions (northeast, north, northwest, east, central, south, and southwest) all registered decreases in area sown to grain crops. Farmers in the south region were especially vigorous in shifting sown area from grain to more profitable cash crops, such as fruits and vegetables, at an annual average rate of 1.9 percent per year. In the pre-reform period, from 1963 to 1978, all the regions registered yield growth rates above 2 percent, while the northern region had the highest annual average growth rate, 5 percent. Yield growth rates in most of the regions rose in the first half of the reform period and then dropped sharply in the last part.

Because of harsh climatic conditions such as erratic precipitation, a short growing season, early killing frosts, and limited irrigated area, grain yields in the northeastern region had the greatest year-to-year variation. Conversely grain yields in the south region had the most stable yields because of a long growing season, a long frost-free period, and more regular rainfall patterns. From 1963 through 1989, grain yields in the

northeastern and southwestern regions became more variable while yields in the northern and eastern regions became less variable.

From 1963 to 1989 the annual average grain production growth rate increased most rapidly in the northern region at 3.75 percent, compared with the south region which had the slowest growth rate, 2.3 percent. Regional production growth rates increased most rapidly during the early part of the reform (1979-84), primarily because the purchase price for grains increased and because a complex mix of incentives embodied in the newly initiated land contract system encouraged farmers to raise grain crops. Conversely, during the 1985-89 period, annual average growth rates for grain output fell sharply as government policies shifted relative prices for crops and as input prices soared. Because of low profit margins for raising grain, farm families shifted resources away from grain production to more profitable crops, livestock feeding operations, and rural enterprises engaged in manufacture, services, construction, and transportation activities.

This article reviews trends in provincial and regional grain area, yield, and production. It identifies regions which have had rapid (slow) grain production growth rates, those which have high (low) year-to-year variations in grain yields, and those which have increased (decreased) variation in grain yields through time. Finally, it identifies those regions and provinces which are grain deficit and require foreign grain imports in order to supply the basic requirements of citizens.

Introduction

Only a decade ago analysts struggled to understand trends in national grain production, output of various grains, and trends in yield increases. Then, beginning in the early 1980's with the publication of statistical yearbooks, USDA analysts acquired data to piece together a fairly complete picture of China's national grain economy (8,10). In the past two decades, ERS resources were allocated to outline the major features of the *national* grain economy, first, because it was important to understand the nature of the macro grain economy and,

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Table B-1--Grain sown area, annual-average growth rates, by region, and by selected time periods

Geographic region	Annual-average growth rate (percent)				
	Total	Pre-reform	Reform	Early reform	Late reform
	1963-89	1963-78	1979-89	1979-84	1985-89
Northeast	-0.20	-0.05	-0.36	-0.43	0.26
North	-0.62	-0.31	-0.54	-1.65	0.26
Northwest	-0.96	-0.77	-0.95	-1.53	0.95
East	0.01	0.16	-0.07	0.49	0.36
Central	-0.21	0.29	-0.58	-0.71	0.37
South	-0.31	1.26	-1.90	-2.08	0.61
Southwest	0.12	0.87	-1.06	-1.74	1.07
National	-0.36	0.05	-0.69	-1.07	0.51

Source: (5). Provincial and regional total grain area, yield, and output data can be obtained by purchasing the ERS China Section's data set which has been organized into tables in LOTUS 1-2-3 and saved on diskettes. Interested parties may write to ERS-NASS, P.O. Box 1608, Rockville, MD 20849-1608; or call toll free, 1-800-999-6779 and ask for "China: Grain Statistics," order number 90011.

second, because national data were published before provincial data generally became available (2).

However, research results reported in this paper suggest that China's grain economy is not homogenous. Rather, various regions have generated different rates of growth in the period from 1963 to 1989. The regions have different agroclimatic regions and different resource endowments. This article uses provincial grain area and production data from *The Encyclopedia of China's Rural Economic Statistics*, published in 1989 by the Ministry of Agriculture (5). This new data source permits researchers to expand the analysis of provincial and regional grain economies both with respect to the time period covered (1963 to 1989), to *area* sown to grain crops, and to trends in *yields*.

Annual-average growth rates for regional data were calculated for the five time periods noted below. First, a picture of long-term trends were obtained for grain area, yield, and production for the 27-year period from 1963 to 1989. Next, growth trends for the 16-year period from 1963 to 1978 were calculated. It was important to calculate growth trends for this period to serve as a base for comparison of growth rates during the reform period. In this period China's farmers gained back some of the ground lost during the frenetic and destructive "Great Leap Forward" campaign (1958-61). The Cultural Revolution (1965-1975) unfolded in this period, but it had much less effect on rural production compared with urban industrial output.

Third, growth rates were calculated for these regional economies for the 11-year period from 1979 to 1989. Beginning in 1979, China's leaders initiated reforms which substantially changed the functioning of the rural economy. They demobilized the commune system and, in its place, set up a township/village system. They implemented the household production contract system and allowed rural markets to

function again. Finally, growth rates were calculated for these regional economies for the first part of the reform period (1979-1984) and again for the last part (1985-1989). Government and Party policies during the first part of the reform period encouraged grain production. But policies changed during the last half of the period. Relative prices in rural areas changed, which induced farmers to pay less attention to grain production. At the same time, government and Party administrative machinery implemented policies such as promising grain farmers limited supplies of chemical fertilizers at low prices to encourage grain outturn but, then, failed to deliver the fertilizer.

China's statistical authorities define "total grain" as wheat, rice, coarse grains (corn, sorghum, millet, barley, oats), tubers (converted to grain equivalents on a 5:1 basis), soybeans, and miscellaneous grains (peas, beans, pulses, buckwheat, and other minor grains). Grain area and production data were published for 29 provinces (including the three provincial-level cities of Beijing, Tianjin, and Shanghai). See the map below for the location of provinces and regional groupings (figure B-1). Note that Hainan was separated from Guangdong Province in 1988, and data for Hainan Province have been published for the past 5 to 6 years. But we were not successful in finding a method to separate data for the two provinces for the period from 1963 to the mid-1980's. Thus, data for Guangdong are composite figures including both Guangdong and Hainan.

Grain Sown Area

To analyze trends in area sown to grain in the various regions, provincial grain area data was aggregated to form regional totals. Annual average growth rates for the five time periods were calculated and presented in table B-1.

Over the 27-year period from 1963 to 1989, all of the regional grain economies, except for the southwestern and eastern

Table B-2--Grain yields, annual-average growth rates, by region, by selected time periods

<u>Geographic region</u>	<u>Annual-average growth rate (percent)</u>				
	Total	Pre-reform	Reform	Early reform	Late reform
	1963-89	1963-78	1979-89	1979-84	1985-89
Northeast	3.55	3.95	2.95	7.22	1.76
North	4.33	5.06	3.44	6.25	1.05
Northwest	3.70	3.78	4.33	6.03	3.22
East	3.49	3.60	2.91	5.36	0.15
Central	3.69	3.36	3.14	5.54	0.47
South	2.75	2.27	2.08	4.59	2.19
Southwest	2.87	2.17	2.37	5.98	0.30
National	3.61	3.43	3.01	5.93	1.00

Source: (5).

regions, reduced area sown to grain crops. First, grain area was reduced because of the fall in arable land area stemming from the building of roads, railroads, factory sites, towns, urban areas, and residential housing. On a national basis there was a decrease in arable land from an estimated 106.4 million hectares in 1963 to 95.2 million hectares in 1989. Second, from 1963 to 1989, farmers in the various regions allocated less farmland to grow grain crops but increased the quantity of land sown to cotton, oilseed, tobacco, sugar, fruits, and vegetable crops.

In the 1963-78 period, farmers in the three regions in northern China reduced area sown to grain. Conversely farmers in the four regions in *southern China* increased area sown to grain. In this period farmers in the *southern region* increased area sown to grain at the rate of 1.26 percent a year.

During the reform period (1979-89), area sown to grain in all the regions registered negative growth rates. In the 1979-84 period, aside from the eastern region, all of the regions reduced area sown to grain crops. Farmers in the northern, northeastern, southern, and southwestern regions especially adjusted area sown to grains and shifted to raising crops with higher profit margins. But, in the 1985-89 period, government authorities feared falling grain area might affect overall development of the rural and national economy and they implemented policies to increase area sown to grain crops. For example, local government and Party cadres responsible for managing the household land contract system pressured farmers to increase area sown to grains as a precondition to continuing their land contracts. In this 5-year period, grain area rose at an annual average rate of over 0.5 percent.

Regional Grain Yields

Provincial grain data was tabulated to calculate regional yields. Table B-2 provides national and regional trend yields for five separate time periods. Over the 27-year period from 1963 through 1989, grain yields in all the various regions registered

positive growth rates. Regions in northern China generally had higher growth rates than those in southern China (possibly because of the expansion of irrigated area).

Annual average growth rates for yields in the various regions during the 11-year reform period (1979-89) do not appear spectacular compared with rates before reforms were initiated. A more detailed examination of the data, however, suggests that regional yield growth rates were substantial during the early part of the reform (1979-84). During this period the government raised the purchase price for grain, and inputs such as chemical fertilizer increased. The household land contract system and the opening up of rural markets provided incentives to farm families to raise grains. Most of the regions experienced yield growth rates in excess of 5 percent.

But in the latter part of the reform period, shifts in the relative prices of crops and livestock, rising input costs, and expanded alternative work opportunities for the rural population combined to reduce incentives to raise grain crops. During 1985-89, most regions generated annual-average growth rates under 1 percent. Only farmers in the northwestern and southern regions managed to produce yield growth rates in excess of 2 percent.

Which Regions Have the Greatest Yield Variations?

Percentage yield changes from the previous year were calculated for 1963 to 1989 to highlight year-to-year yield variations. Grain yields in the northeastern region had the widest degree of year-to-year fluctuations (figure B-2). This result should be expected because grain raised in this region is subject to China's harshest climatic conditions. It is the northernmost region in China where the least amount of grain is irrigated, where the growing season is shortest, where killing frosts come most frequently, and where precipitation and temperatures fluctuate most widely. Conversely, grain yields in the southern region had the least variation. There, farmers have the longest growing season in China, a large portion of the

Figure B-1--China's Crop Producing Regions¹



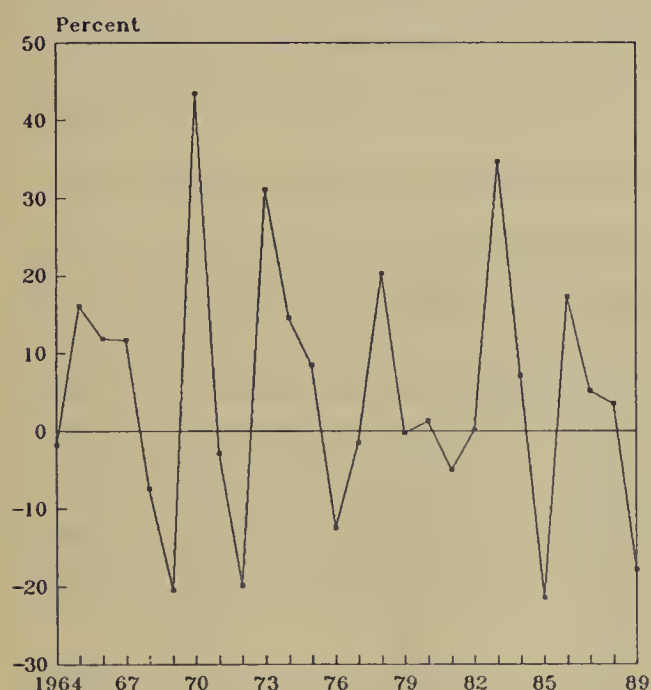
¹ North China is defined here to include the northeastern, northern, and northwestern regions. South China is defined to include the eastern, central, southern, and southwestern regions.

grain area is irrigated, killing frosts are less frequent, and precipitation and temperatures vary the least.

Are Yield Variations Increasing or Decreasing?

Provincial yield data were used to calculate regional coefficients of variation. The coefficients are expressed in percentage terms, which permits comparisons among years. Variation in provincial grain yields in provinces in the northeastern region increased from 1963 to 1989 (figure B-2). Grain yield variation in provinces in the northwestern, southern, and central regions remained fairly stable throughout the 27-year period, while variations decreased in provinces in the northern and eastern regions. While it is easy to plot these yield variations, more information will be needed to assess reasons for the differences and research on this topic continues.

Figure B-2--Annual Percentage Changes in Northeastern Grain Yields



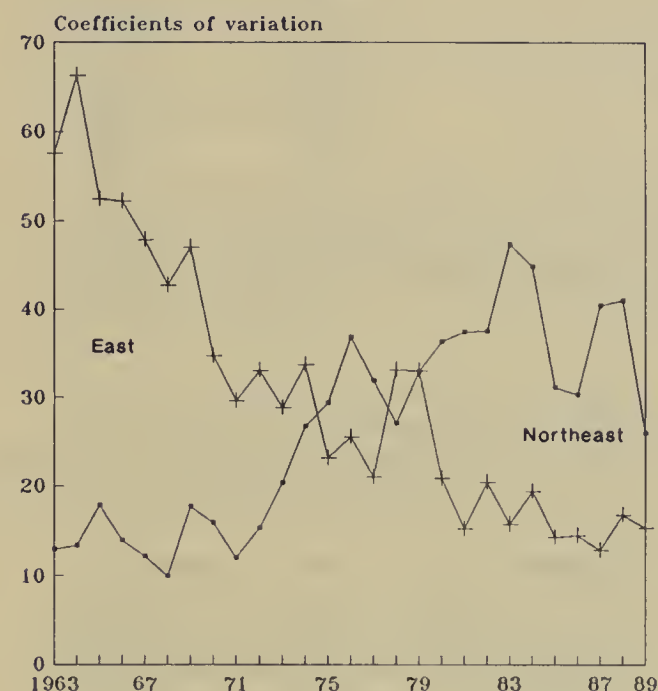
Regional Grain Production

Regional production data was tabulated from provincial figures and average annual growth rates for the various regions and time periods were calculated (table B-3). Over the long term (1963-89), all the regions generated positive growth rates. The northern region registered the highest annual average growth rate of 3.75 percent, which is 1.63 times greater than the southern region's 2.3 percent.

All the regions, except the northwest, registered higher rates of growth in the pre-reform period (1963-78) than in the reform period. Again, as was the case with yield trends, it is important to point out that regional annual average production trends were generally higher in the early part of the reform period (1979-84) than rates during the pre-reform years. It is

interesting to note that grain production growth rates for the northern and southern regions during this generally vibrant period (1979-84) were actually lower than they were in the 1963-78 period. Yield increases in these regions were more-than-offset by relatively large decreases in area sown to grain crops. Farmers shifted cropland from grains to cash crops, such as fruits and vegetables, or used the land in more profitable ways, such as building fish ponds to engage in aquaculture.

Figure B-3--Yield Variations in the Northeastern and Eastern Regions



Policies implemented in the 1985-89 period had the effect of reducing incentives for grain production. Farmers in the various regions responded by reducing grain output growth rates. But farmers in the southern region were an exception, as the growth rate in the 1985-89 period exceeded the 1979-84 rate. Also grain production growth rates in the northwestern region remained high.

Per Capita Grain Production Varies by Region

China's leaders in the 1950's faced a basic problem in managing the rural economy. While there was sufficient grain on a per capita basis for the whole country, grain output and population within the country were not evenly distributed--some areas were grain rich and other areas were grain poor.

Over the past four decades, China's leaders used the rule of thumb of 275 kilograms of grain per person to define the condition of grain self sufficiency--enough grain for seed, feed, and cereals to supply 1,700 to 1,900 calories per person per day (9).

For example in the eastern region in 1957, citizens of Zhejiang Province had 306 kilograms of grain per capita, while citizens in nearby Shanghai had only 148 kilos.

Table B-3--Grain production, annual-average growth rates, by region, by selected time periods

Geographic region	Annual-average growth rate in percent				
	Total	Pre-reform	Reform	Early reform	Late reform
	1963-89	1963-78	1979-89	1979-84	1985-89
Northeast	3.34	3.86	2.61	6.81	1.92
North	3.75	4.81	2.96	3.35	0.89
Northwest	2.67	3.00	3.19	4.50	4.23
East	3.49	3.80	2.83	5.89	0.45
Central	3.44	3.67	2.59	4.85	0.84
South	2.30	3.49	0.20	2.55	2.70
Southwest	2.92	3.05	1.39	4.28	1.37
National	3.23	3.49	2.37	4.88	1.51

Source: (5).

Table B-4--Annual per capita grain production, by region, 1963-89

Year	Northeast	North	Northwest	East	Central	South	Southwest
1963	287	164	252	240	285	257	250
1964	276	195	271	275	303	280	266
1965	316	223	294	291	327	303	281
1966	340	238	289	304	331	296	288
1967	372	241	284	290	311	297	278
1968	339	218	236	291	313	278	252
1969	266	228	246	283	297	290	248
1970	376	247	274	315	337	301	271
1971	353	257	277	330	344	321	277
1972	271	239	246	338	334	320	256
1973	342	268	264	355	344	311	279
1974	389	273	280	315	351	328	260
1975	414	323	298	332	358	327	263
1976	352	301	278	357	361	310	256
1977	340	274	270	319	355	328	282
1978	405	303	281	357	362	315	304
1979	405	318	288	384	410	331	305
1980	398	296	260	344	370	337	313
1981	370	298	261	369	384	315	309
1982	362	304	285	414	425	354	335
1983	490	347	306	419	444	352	346
1984	522	359	319	463	464	335	355
1985	391	355	306	429	447	298	323
1986	496	346	304	450	450	288	324
1987	495	360	311	442	450	308	323
1988	484	338	329	424	428	270	309
1989	403	355	334	424	441	302	329

Source: (2,5).

Rather than using markets to resolve imbalances between demand and supply, China's leaders mitigated inequities in per capita grain production by implementing the "planned purchase and planned supply system" (3). Cadres in the mid-1950's managed all aspects of grain production, purchase, storage, transportation, milling, and distribution of final grain products. Excess grain was purchased in surplus areas and shipped to deficit areas. These transfers occurred at county, prefecture, and provincial administrative levels. Interprovincial grain transfers in the mid-1970's, for example, averaged about 3 million tons a year, 1.1 percent of total grain production (4).

By 1963 only citizens in the northeastern and central regions had reached the self-sufficiency standard of 275 kilograms of grain per capita (table B-4). In that same year consumers in the northern region, with 164 kilograms per capita, were in a substantial deficit situation. Per capita grain production in the remaining regions rose over time. By 1964, the southern region had achieved self-sufficient status, the eastern region in 1965, and the northern region in 1975. Per capita grain production in the northwestern and southwestern regions fluctuated around the 275-kilogram norm for a decade. Farmers in the southwestern region were finally able to keep production above the 275-kilogram mark after 1977, while farmers in the northwestern region managed the feat in 1985.

Which Regions Receive Imported Grains?

During the tremendous disruptions caused by the "Great Leap Forward" and the subsequent decrease in per capita grain production, millions of citizens perished. In 1960 China's leaders initiated grain imports to cover the shortfall in grain production. In 1963 the northern region had the lowest per capita grain production, 164 kilograms. An examination of 1963 provincial and municipality data for the northern region revealed that residents in Beijing only had 114 kilograms, while citizens in Tianjin had 106 kilos. At the same time, residents of Shanghai in the eastern region had only 131 kilograms, while residents of Guangdong had an average of 278.

Per capita grain production near these three large municipalities rose through time and by 1989 Beijing residents had 234 kilograms, Tianjin had 199, and Shanghai had 182. These numbers still reflect grain deficits and provide clear reasons for continued interprovincial grain transfers and grain imports. Demand for grain has been high in these regions due to population growth and increased income that allows consumers to demand finer quality food grains (wheat and rice) and feed grains to support the growing meat demand. Policymakers in these regions stress the need for increased grain production to better balance supply with demand. Hence, even though these regions generate somewhat healthy annual-average growth

rates, demand outstrips supplies. Interprovincial grain transfers, along with foreign imported grain, are needed to fill the gap.

References

1. Agricultural Yearbook Editing Committee, Minister He Kang, Chairman. *Zhongguo Nongye Nianjian (China Agricultural Yearbook)*, volumes from 1980 to 1989, Beijing, Nongye Chubanshe.
2. Crook, Frederick W. *Agricultural Statistics of the People's Republic of China, 1949-86*. Statistical Bulletin, No. 764, U.S. Department of Agriculture, Economic Research Service, April 1988.
3. Donnithorne, Audrey. *China's Economic System*. Praeger Publishers, New York, 1967.
4. Lardy, Nicholas R. *China's Interprovincial Grain Marketing and Import Demand*. Agriculture and Trade Analysis Division, Economic Research Service, U.S. Department of Agriculture. Staff Report No. AGES 9059, Washington, DC, September 1990.
5. Ministry of Agriculture, Planning Office. *Zhongguo Nongcun Jingji Tongji Dachuan. 1949-1986 (Encyclopedia of China's Rural Economic Statistics, 1949-1986)*. Beijing, Nongye Chubanshe, May 1989.
6. State Statistical Bureau. *Quanguo Gesheng, Zizhiqu, Zhixiashi, Lishi Tongji Ziliao Huibian, 1949-1989 (A Compilation of Historical Statistics for all Provinces, Municipalities, and Self Administrative Regions)*. Zhongguo Tongji Chubanshe, Zhengzhou, August 1990.
7. _____. *Zhongguo Tongji Nianjian, 1990 (China Statistical Yearbook, 1990)*. Zhongguo tongji chubanshe, Beijing, 1990.
8. Tuan, Francis C. *PRC Provincial Total Grain Production, 1969-79*, Research Notes on Chinese Agriculture, No. 2, IED, Economics and Statistical Service, USDA, Staff Report No. AGE8801223, January 1981, 38 pages.
9. Walker, Kenneth R. *Food Grain Procurement and Consumption in China*. Cambridge University Press, Cambridge, 1984.
10. Webb, Shwu-Eng H. "Regional Crop Production Patterns in China," U.S. Department of Agriculture, Economic Research Service, *China: Agriculture and Trade Report, Situation and Outlook Series*, RS-90-3, July 1990, pp. 30-36.

China's Agricultural Commodity Policies in the 1980's

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Abstract: The Government of China (GOC) implemented many reform measures in the 1980's which loosened its rigid control of agricultural production. However, the GOC continued to intervene heavily in its agriculture. Producer and consumer subsidy equivalents (PSE's/CSE's) are calculated to measure government intervention across major agricultural commodities from 1979 to 1989. Two sets of reference prices are used to estimate the PSE's/CSE's: Hong Kong import prices and unit values of Asian exports. With continuous increases in domestic procurement prices, China even subsidized some of its grain and oilseed production for several years in the late 1980's. China has always subsidized consumption of most agricultural commodities.

Keywords: reform, intervention, procurement, ration, subsidy, net returns, efficiency, reference price, trade, producer subsidy equivalents, consumer subsidy equivalents.

Introduction

Despite the rural reforms initiated in 1979, the Government of China (GOC) still intervened heavily in its agriculture. Border measures effectively insulate domestic markets from influences of the world markets. The producer subsidy equivalent (PSE) and consumer subsidy equivalent (CSE) have been used since the 1979 economic reforms to evaluate the GOC's intervention in the production and consumption of its major agricultural commodities.

A set of preliminary PSE/CSE estimates for major grain, oilseed, and livestock products, plus sugar and honey, between 1982 and 1987 was presented in the 1989 issue of this report (11). This article updates PSE/CSE estimates to 1989 and extends the series back to 1979. This study also uses different reference prices as a base for the calculation of PSE/CSE estimates--Hong Kong import prices and unit values of Asian exports. One of the most important GOC direct payments--input subsidies that are tied to procurement policies--is also reviewed.

China's Agricultural Commodity Policies

From 1953 to 1979, the production, distribution, and trade of most major agricultural commodities in China were governed by rigid central planning. There were compulsory quotas for major agricultural products at prices well below world market levels. The government also had a cheap-food policy under which it distributed procured agricultural commodities to urban residents at very low prices. This system taxed peasants heavily to support industrial development and urban residents. Under this compulsory procurement system, incentives to produce were very low and agricultural productivity and living standards rose very slowly from 1953 to 1978.

In order to stimulate production and raise peasants' living standards, the GOC initiated economic reforms in rural areas in 1979. Reform measures implemented during the last decade decentralized decisionmaking of agricultural economic activities. However, the GOC still intervenes in agricultural production

and marketing with the following policies: (1) procurement and pricing policies; (2) input-use policies that are tied to procurement policies; (3) heavy subsidies for agricultural products rationed to urban residents; and (4) border measures adopted by the state to restrain agricultural trade. In 1989 the GOC adopted many austerity measures, such as substantial cuts in loans and investments to control inflation. Furthermore, the GOC tightened its control over agricultural production to increase grain production.

Procurement and Pricing Policies

When reforms were initiated in 1979, the most important policy changes initially were to increase the portion of output that could be sold to the government at above-quota prices and to raise procurement prices for most agricultural commodities (an average of 22 percent in 1979 (5)). The price premium associated with the above-quota procurement was also raised from about 20 percent to 50 percent above quota prices. The adoption of the Household Production Responsibility System (HPRS) perhaps had the most profound impact on liberalizing agricultural production decisionmaking. Under the HPRS, individual peasants were given the power to select the product mix and to maximize their returns after meeting state contract and collective obligations. Peasants could sell their surpluses to the government or on the open market.

Peasant production incentives increased substantially because they were allowed to keep all output in excess of state and collective obligations, and were given some control of their production decisions. The production of almost all commodities peaked in 1984. The GOC tried to use the initial success of rural reforms as an opportunity to broaden reform. By 1985 the government had reduced the number of commodities under compulsory quota procurement from 180 to 21 (1). It had also lessened the control over some of the commodities that remained under compulsory state procurement.

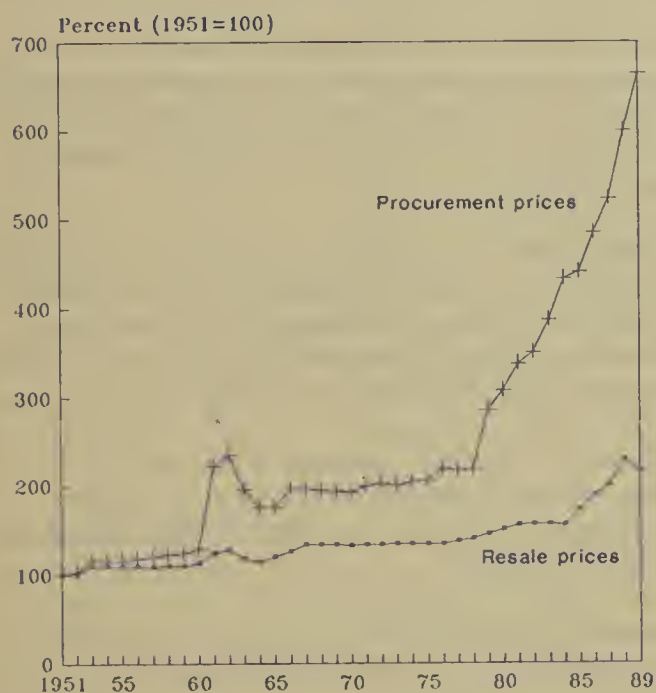
In 1985, the state modified the compulsory procurement system for staple foods and adopted a "two-track" procurement system--contract and negotiated. Under the new system, the state was

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supposed to negotiate "contracts" with peasants prior to planting. The state could procure beyond the contracted amount only at "negotiated" prices. However, the GOC quickly discovered that peasants' profit incentives were in conflict with the government's objective of meeting its urban commitments. The new system quickly reverted back to the old system of quota and over-quota procurement. The negotiated procurement was just like the old "above-quota" procurement in which the government set the terms of trade rather than rely on negotiation.

To encourage grain production, the GOC had to continue to increase the negotiated (or the above-quota) portion of grain procurement. Contract procurement declined from 91 percent of total government purchases in 1979 to slightly less than 50 percent in 1989 (6,8). The state has also raised procurement prices a number of times since the 1979 economic reform, as shown in figure C-1. Prices paid for negotiated procurement were in general about 35 percent higher than contracted prices and 10 percent lower than market prices. The price increases were across all commodities and were all of about the same magnitude. Thus, the relative net returns on grains and cotton continued to be lower than those for other commodities, such as vegetables and pork. As a result, grain production fell after the record harvest in 1984 and stagnated between 1985 and 1988. The GOC continued to have difficulty in obtaining adequate grain supplies to meet its urban commitments. In 1989, the government decided to recentralize grain production and trade and put its economic reforms on hold.

Figure C-1
China's Food Prices, 1951-89



Urban Rationing Policy

In the 1980's, reforms in the urban food subsidy system were mainly on nonstaple foods. The distribution of staple foods

remained tightly controlled by the government. By 1985, there were three types of pricing systems for consumer goods in China:

- **Total state control**--The distribution and pricing of sugar, cotton, tobacco, and silk were strictly controlled by the state.
- **The double-track system**--Since the reforms, the GOC loosened the control of the distribution of most agricultural commodities, including grains, edible oils, and livestock products and adopted a double-track system. Relaxation of price controls was greater for livestock products and high-valued cash crops than for other staple goods. Under the double-track system, the GOC still distributes most agricultural commodities to urban residents and specialized households at fixed, low prices. Nonurban residents and coupon recipients who wish to purchase more than the rationed amount have to purchase from open markets. The GOC has increasingly distributed agricultural commodities to industrial users, such as food- or feed-processing enterprises, at the "negotiated" prices, instead of low, fixed prices.
- **Open markets**--Some agricultural commodities, such as certain vegetables, were completely free of government control.

To facilitate industrial development in the 1950's through the 1970's, the GOC had adopted a low wage policy for government employees and industrial workers in large cities. In return, the GOC provides cheap food, housing, utilities, and public services to urban residents. Therefore, the state is very sensitive to the demands of urban residents and their resistance to paying higher food prices. As a result, the GOC had to keep its rationing policy for staple foods intact in urban areas, despite the agricultural reforms in rural areas. In the 1980's the government significantly increased procurement prices for farm products a number of times, while prices charged to urban consumers remained fairly stable as shown in figure C-1. To make up the price difference between the procurement prices and urban, subsidized, resale prices for grains, edible oils, and pork, urban subsidies increased from 8 billion yuan in 1979 to more than 40 billion in 1989.

Government data on subsidies are very limited. In fact, the only piece of information regarding budget expenditures on agricultural subsidies is the aggregate expenditure making up the difference between procurement prices and government resale prices to urban residents (5). A weighting scheme was developed, based on the amount and value of procurement, to allocate these total subsidies into individual commodities and shown in table C-1.

Input Use Policies

Prior to 1979, the GOC tightly controlled input markets. There was virtually no mobility of production factors. Since the reforms the government has allowed peasants to engage in other economic activities, as long as they complete the required

Table C-1--Price subsidy on urban consumption of major agricultural commodities, 1979-1989

Item	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Yuan/ton											
Rice	20.35	30.45	39.66	38.92	38.65	41.72	53.45	49.74	51.51	62.73	74.33
Wheat	27.65	40.63	46.92	51.12	55.86	62.82	80.60	69.29	78.19	86.93	97.05
Corn	31.64	45.75	62.88	59.21	72.60	67.22	70.35	77.43	92.38	93.92	96.92
Soybean	40.41	59.66	67.23	66.92	80.09	81.62	83.86	96.42	111.69	132.39	179.18
Peanuts	120.01	194.59	253.23	220.89	187.91	180.68	256.24	248.59	269.47	298.16	341.65
Rapeseed	120.01	194.92	253.19	220.96	187.74	180.66	255.95	248.59	269.22	298.24	341.21
Sesame	121.99	193.84	253.50	222.41	187.33	181.13	253.95	248.59	267.39	300.98	339.45
Cotton	181.82	263.59	320.85	291.81	283.92	223.43	389.64	355.70	345.95	366.11	408.02
Pork	na	na	na	na	na	na	na	202.57	232.93	200.24	190.93

Source: compiled from (5), p. 244.

delivery of contracted goods and collective obligation. Peasants could purchase the required grains from the open markets. More often, the young and better educated rural laborers worked in rural enterprises and left the farming to the women and elderly. Investment of private capital in rural enterprises was allowed.

Collective land under the HPRS was usually contracted out to each household (in proportion to its number of workers) for 1 to 3 years.

The state allowed a limited transfer of land-use rights, the hiring of limited laborer services, and the extension of leases to 15 years in some areas. However, in most areas, contract land is still subject to negotiation each year and local cadre approval is required. Land use is still tightly controlled by the government and most of the land contracted out to households is for the production of commodities to meet required procurement amounts.

To facilitate procurement, the government has often used input subsidies to induce cooperation from peasants. Currently there are three input subsidies tied to contract procurement: advanced payment of up to 20 percent of the contracted value; a guaranteed amount of fertilizer, pesticides, and plastic sheeting at low, subsidized prices; and a guaranteed amount of diesel fuel at a subsidized price.

The government also provides extension services, irrigation projects and other assistance. However, due to the difficulty of getting data, the study only includes price subsidies for fertilizers, chemicals, and plastic sheeting (table C-2).

Border Intervention

The formulation of China's foreign trade policy still relies heavily on central planning. The Ministry of Commerce, along with other ministries, provides information on supply, demand, and available stocks of commodities to the State Economic Planning Commission which, in turn, draws up an annual commodity trade plan (10). Annual trade plans for the different commodities are carried out by various trade

corporations which are directly subordinate to the Ministry of Foreign Economic Relations and Trade (MOFERT). For example, all of China's trade in major grains and oilseed crops is handled by the National Cereals, Oils, and Foodstuff Import and Export Corporation (CEROILFOOD). The quantity imported depends upon the urban rationing requirements and commitments to domestic industrial uses that cannot be met by procurement. The availability of foreign exchange and world prices also determine the quantity imported. Exports depend on product availability, world prices, and agreements with trade partners.

Major changes in trade policy since the economic reforms have been:

- o The reduction of restrictions on imports. The government began to permit an increase in wheat imports in order to allow for increased specialization in cash crops and livestock, as well as for greater regional specialization.
- o Local governments were allowed to retain a portion of their foreign exchange earnings to import equipment and materials necessary for production. They were also allowed to sell their foreign exchange to other enterprises for domestic currency at higher-than-official rates.
- o Since 1987, the GOC has adopted the contract responsibility system for foreign trade cooperations, making them responsible for their own financial profits and losses (10).

In foreign trade, commodities can be categorized into three trade groups similar to the domestic marketing of goods (10):

- o Exports and imports of essential commodities (such as grains, oilseeds, crude oils, cotton, and fertilizers) can be exported and imported only through national trade corporations.
- o Trading of "sensitive" products (such as wool and rabbit hair) that have limited international markets, is handled

Table C-2--Estimated input subsidies per unit of production, 1979-89

Item	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Yuan/per ton											
Rice	5.08	3.09	3.45	2.89	2.36	2.63	4.58	6.97	7.82	11.00	11.17
Wheat	6.90	4.12	4.08	3.79	3.41	3.96	6.90	9.71	11.87	15.25	14.59
Corn	7.90	4.64	5.47	4.39	4.43	4.24	6.02	10.85	14.03	16.47	14.57
Soybean	10.08	6.05	5.85	4.96	4.89	5.15	7.18	13.51	16.96	23.22	26.93
Peanuts	29.95	19.74	22.04	16.38	11.48	11.39	21.93	34.82	40.92	52.29	51.36
Rapeseed	29.95	19.77	22.03	16.38	11.47	11.39	21.91	34.82	40.89	52.31	51.29
Sesame	30.44	19.67	22.06	16.49	11.44	11.42	21.74	34.82	40.61	52.79	51.03
Cotton	45.37	26.74	27.92	21.64	17.34	14.08	33.35	49.82	52.54	64.21	61.34
Sugar	183.47	115.50	104.69	96.46	84.50	76.50	159.67	186.75	231.02	364.91	292.79

Source: Compiled from (5), 1990, p. 244.

by local governments and subject to approval from national corporations.

- o Several goods that are either not essential to basic needs nor sensitive are traded freely by licensed local corporations.

Quantifying Government Intervention in China's Agriculture

Open markets for crops are very limited in China. Transportation difficulties and heavily subsidized urban markets prevent peasants from expanding their open market sales. Open market grain sales from peasants to nonrural areas increased from about 1.2 million tons in 1978 to 6.2 in 1989 (5), but still accounted for less than 5 percent of total grain production. The government is virtually the sole buyer of grains from peasants. The state acts like a monopsony and to a large degree determines grain prices. Under China's domestic procurement and rationing policies, prices have become only an administrative means for the GOC to meet its objectives. Prices are not a mechanism for allocating resources efficiently. To meet self-sufficiency goals and to prevent resources from shifting out of agriculture, the GOC has to continue to increase prices of all agricultural commodities, despite large fluctuations in trade prices in response to changes in world market conditions.

The PSE's and CSE's are estimates of the amount of cash subsidy or tax needed to compensate farmers or consumers for removing government intervention. The PSE/CSE estimates are used to evaluate the effects of government intervention across major agricultural commodities in China. Estimates of PSE/CSE's presented here do not account for government investments in infrastructure such as irrigation, transportation, or any of the marketing services that contribute value-added to the commodities. However, in this report it is assumed that government services were proportionately applied across all agricultural commodities. The PSE's/CSE's, when compared across agricultural commodities, show the relative degree of intervention in different agricultural commodities.

Calculations of PSE's/CSE's

A PSE is calculated as the difference between the domestic producer price and reference price, plus input subsidy per unit of output. A CSE is calculated as the difference between the reference and domestic consumer price. The domestic consumer price is the procurement price, minus the price subsidy per unit of output. Then, the reference price is used as a basis for computing the percentage of support or tax. The calculations of PSE's/CSE's in percentages can be expressed as:

$$\begin{aligned} \text{PSE} &= \{P^{dp} + S - P^r\} / P^r \times 100 \\ \text{CSE} &= \{P^r - (P^{dp} - U)\} / P^r \times 100 \end{aligned}$$

where,

P^{dp} : Domestic producer prices
 S : Input subsidies per unit of output
 P^r : Reference price
 U : Urban subsidies per unit of output

Data Sources

Input subsidies and urban price subsidies per unit of output are estimated from aggregate budget data published in *China's Statistical Yearbook* and presented in tables C-1 and C-2. Because the open market share of agricultural commodities is a very small proportion of agricultural production, and due to the difficulty of getting market data, this study uses average procurement prices shown in table C-3 as a proxy for domestic producer prices. These prices therefore, are calculated as the domestic procurement price, minus the per unit urban price subsidy. There are many alternatives for selecting a reference price for each commodity.

The choice of reference prices has a significant impact on the calculation of PSE's/CSE's. Two alternative reference prices are considered in this study--Hong Kong import prices and the unit value of exports for Asia.

The source for both Hong Kong import prices and the unit value of Asian exports is *FAO Trade Yearbook* (9). Hong

Table C-3--Average procurement prices for major agricultural commodities in China, 1979-89

Item	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Yuan/ton											
Total grain	229.64	247.78	271.81	282.14	311.20	355.40	370.40	415.60	446.00	523.80	664.70
Rice	222.91	240.29	252.79	254.81	280.80	336.60	350.00	371.60	421.10	523.40	684.08
Wheat	282.45	304.48	320.31	332.49	366.40	438.00	427.40	462.80	476.70	527.00	642.41
Corn	194.26	209.41	220.30	228.68	252.00	298.20	310.60	359.60	363.90	416.40	548.82
Soybean	366.54	405.03	639.14	664.07	731.80	669.80	715.20	842.00	900.10	1,129.20	1,386.66
Peanuts	814.18	815.00	815.00	815.82	843.20	953.00	992.60	1,054.78	1,118.07	1,560.20	1,869.12
Rapeseed	810.19	811.00	811.00	811.81	847.00	900.20	900.20	941.97	998.49	1,135.80	1,360.69
Sesame	1,332.86	1,334.20	1,334.20	1,335.54	1,480.80	1,511.80	1,578.20	1,699.00	1,800.94	2,833.60	3,394.65
Cotton	2,680.00	3,174.00	3,116.00	3,236.00	3,422.00	3,418.00	3,218.00	3,216.00	3,563.00	4,002.00	4,951.00
Sugar	412.93	484.08	507.98	471.30	498.31	529.23	579.38	630.71	681.56	882.31	1,086.66
Pork	1,788.09	2,026.27	1,978.69	1,952.68	1,923.08	1,893.29	2,408.37	2,499.01	2,773.30	4,516.44	5,012.50
Beef	1,493.20	1,907.29	2,128.64	2,642.19	2,480.71	2,592.32	3,258.06	3,494.20	4,101.97	5,484.28	6,593.05
Mutton	1,685.71	2,066.67	2,415.09	2,336.45	2,504.50	2,500.00	3,341.88	3,486.65	4,262.27	5,659.80	6,546.80
Egg	1,680.00	1,714.00	1,840.00	1,864.00	1,886.00	1,976.00	2,266.00	2,424.00	3,042.00	3,658.00	4,168.00
Honey	2,066.00	2,008.00	1,898.00	1,882.00	1,892.00	1,826.00	1,641.20	2,065.00	2,414.00	2,558.00	3,137.00

Source: (4).

Kong import prices are calculated as the total value of that commodity imported, divided by the total quantity imported into Hong Kong. If Hong Kong prices are not available, prices based on Asian imports are used. Hong Kong import prices would be ideal for reference prices because Hong Kong is a free port and shares a cultural background similar to China. However, the use of Hong Kong import prices as reference prices could exaggerate PSE/CSE estimates. Import prices in general are c.i.f., which includes freight rates. As the higher living standard of Hong Kong might imply, it imports higher quality commodities.

The other alternative is to use the unit value of exports from China as a proxy for export prices. These are calculated as the value of that commodity exported, divided by the total quantity exported from China. China's export unit values are from China's customs statistics (5,7). The unit values of Asian exports calculated with data from *FAO Trade Yearbooks* are very close to China's export unit values, and FAO reports carry more complete data and provide easier access for researchers than Chinese sources. Therefore, Asian export unit values were used instead of China's export unit values. The only exception is for rapeseed, as the FAO does not report it as a single commodity.

The unit import or export values seem to move together over time in reflecting changes in world market conditions. However, there are large differences in unit values between agricultural imports and exports in any particular year. Two factors contribute to these differences. Import prices include additional freight charges and reflect a premium for higher quality. The quality difference is perhaps the most important factor. The developed countries or areas of the region, such as Hong Kong, also are the major importers. Hence, the agricultural products they import reflect their preferences and willingness to pay for higher quality products. The developing

countries of the region, such as China, are predominantly exporters of agricultural commodities. The quality of Chinese-produced agricultural commodities will match more closely the quality of exports from the region than the imports to it. Therefore, it may be more appropriate to use Asian export unit values as reference prices instead of Hong Kong import unit values. Because the first special article on PSE/CSE estimates used Hong Kong import prices, this article presents both sets of PSE/CSE estimates for comparison.

Reference prices in U.S. dollar (U.S.\$) terms are converted into China's currency, the Renminbi (RMB), which is denominated in yuan in exchange rate calculations. In this article, official exchange rates are used to convert world reference prices into domestic prices. However, shadow exchange rates in China are often much greater than the official rates, suggesting that the yuan is overvalued. For example, the official exchange rate between 1987-89 was U.S. \$1 for 3.72 yuan, but in the open markets, the rate was U.S. \$1 for about 7 yuan. Yuan has been devalued continuously since reforms began, except in 1980 (appendix table 13). If shadow exchange rates are used, the absolute magnitudes of positive CSE's and negative PSE's would be much greater. Positive PSE's and negative CSE's will be smaller, or even change signs, depending on the difference between the shadow and official exchange rates.

PSE Estimates: Use Hong Kong Import Prices

A negative PSE represents a tax on the producers of that commodity. Negative PSE's indicate that the prices received by peasants, plus input subsidies, are less than corresponding prices in world markets. PSE's shown in table C-4 vary widely across commodities and over time. When Hong Kong import prices are used as reference prices, findings show that China taxed its peasant producers on most commodities over the entire decade, except for oilseed crops, cotton, and sugar.

Table C-4--Estimated Chinese PSE's for two alternative reference prices, 1979-89

Item	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Percent											
PSE's: using Hong Kong import prices as reference prices											
Rice	-45.56	-51.51	-60.45	-56.19	-49.51	-39.26	-43.34	-50.25	-46.21	-55.85	-45.09
Wheat	0.08	-7.06	-17.50	-12.44	-2.24	9.75	-13.99	-10.59	-15.24	-11.89	-17.55
Corn	-10.69	-18.20	-30.26	-19.16	-16.21	-19.41	-23.54	-9.76	3.71	-13.85	-10.55
Soybeans	-29.17	-28.25	-3.00	6.10	28.27	-24.66	-15.82	-8.95	-7.55	-10.42	-2.01
Peanuts	-39.37	-39.70	-55.87	-35.42	-38.54	-45.67	-41.34	-42.76	-40.58	-25.84	-22.64
Rapeseed	80.80	84.20	52.76	47.96	49.46	7.83	2.87	32.16	37.67	8.13	29.61
Sesame	-10.26	-2.96	17.28	29.83	30.57	16.38	2.35	11.99	27.75	64.77	24.40
Cotton	24.97	41.27	13.99	35.13	40.83	6.80	2.50	23.00	3.46	-15.94	7.42
Sugar	51.33	-25.99	-30.68	-3.75	10.14	6.35	37.69	9.97	18.14	31.93	19.66
Pork	-31.32	-21.80	-37.74	-48.43	-50.05	-54.97	-42.57	-54.87	-53.95	-27.16	-22.84
Beef	-63.83	-61.17	-56.58	-50.40	-48.37	-52.99	-49.79	-54.32	-56.53	-43.73	-39.10
Mutton	-41.36	-26.11	-30.52	-31.90	-14.13	-33.77	-19.87	-28.42	-32.56	-22.29	-17.22
Egg	5.78	15.44	-4.87	-12.49	2.49	-18.94	-10.87	-16.36	-8.42	3.54	10.02
Honey	10.41	6.55	-8.50	-10.44	-6.82	-29.10	-62.40	-58.39	-58.61	-45.50	-32.17
PSE's: using Asian unit export values as reference prices											
Rice	-6.56	-15.76	-31.24	-13.72	2.79	17.74	4.56	8.29	3.19	-13.14	5.29
Wheat	24.13	15.58	-7.12	-4.98	5.62	22.51	-6.91	-12.29	17.94	25.44	0.62
Corn	-10.76	-17.69	-16.43	-10.88	-11.17	-2.57	-6.34	2.39	14.36	-1.23	-3.03
Soybeans	-25.46	-15.90	9.01	17.04	40.37	-3.91	0.69	10.30	8.00	10.75	23.63
Peanuts	-28.78	-30.38	-54.08	-42.89	-38.06	-55.64	-47.33	-45.62	-51.98	-33.55	-29.00
Rapeseed	na	na	na	60.62	95.52	29.92	10.94	64.25	46.83	20.98	33.48
Sesame	7.06	6.15	10.91	4.61	10.44	-12.44	-13.69	-4.34	0.20	46.18	22.14
Cotton	15.46	34.54	9.15	24.72	21.26	-10.13	-14.85	4.90	4.70	-20.96	7.12
Sugar	84.60	-4.53	-20.59	0.94	24.75	16.24	53.57	37.11	30.33	47.48	34.77
Pork	-27.82	-22.21	-31.03	-49.32	-45.84	-50.27	-45.44	-58.48	-57.00	-33.49	-25.25
Beef	-42.79	-19.56	-13.86	-10.82	-12.62	-13.56	-19.22	-27.74	-20.87	-3.94	15.34
Mutton	-35.91	-29.91	-38.26	-43.74	-35.29	-41.67	-36.56	-34.65	-32.60	-15.49	0.36
Egg	4.72	12.70	-4.76	-24.49	-15.77	-26.49	-18.30	-35.17	-25.30	-18.27	-3.26
Honey	33.41	22.13	7.28	6.80	-4.27	-17.30	-37.85	-38.54	-35.13	-34.18	-15.47

The continuous increase in domestic procurement prices has reduced the magnitude of agricultural taxes reflected in PSE's for all commodities except for rice. If it were not for the yuan's continuous devaluation, China would show support on its wheat, corn and soybean production. World reference prices in U.S. \$ for peanuts continued to decline in the late 1980's and, with a continuing increase in domestic prices, taxes on China's peanut growers have been smaller in the last few years. If Hong Kong import prices are used as reference prices, PSE's for grain crops are all negative for most of the period.

Among the major agricultural products, rice has the biggest difference between the domestic market price and world price. Food security is still a very important priority. This is reflected in the price ratio of wheat and rice. The procurement price ratio of wheat and rice is just the reverse of the world price ratio. To encourage wheat production, the government set the price of wheat higher than the price of rice. In the world market, the price of wheat, in general, is lower than the price of

rice. In China, rice farmers are taxed much more heavily than wheat producers. Pork production also is heavily taxed with an average PSE of negative 40 percent.

Production and distribution of oilseed crops are under tighter control than grain crops. Total oilseed procurement accounts for 65 to 75 percent of total production. Almost all cotton production is procured by the government. To maintain self-sufficiency of edible oils, China supported the production of sesame and rapeseed (which are the main sources of edible oils in China) at very high prices. PSE's for these two commodities are positive.

Cotton is a very important commodity for textile products, which have been the major export earners for China since the reforms. It appears that the GOC is also supporting the production of cotton in order to support the rapid development of the textile industry in the 1980's.

Table C-5--Estimated Chinese CSE's for two alternative reference prices, 1979-89

Item	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Percent											
CSE's: using Hong Kong import prices as reference prices											
Rice	52.22	58.85	67.71	63.91	57.46	47.23	52.73	58.05	54.24	63.29	53.44
Wheat	11.50	19.35	29.14	25.38	17.03	5.29	30.17	24.65	29.06	27.03	31.35
Corn	28.64	38.26	52.44	42.00	41.90	38.61	44.24	33.79	27.09	38.81	33.14
Soybeans	38.60	39.43	13.79	5.31	-12.71	35.27	27.92	22.02	22.58	24.78	18.80
Peanuts	49.93	55.05	70.99	52.90	53.12	56.96	57.99	58.59	57.45	42.93	39.58
Rapeseed	-48.53	-36.60	-2.29	-5.56	-14.78	14.89	28.13	6.18	3.41	23.78	6.42
Sesame	20.29	18.26	6.55	-6.89	-13.18	-1.67	15.28	6.31	-6.39	-44.57	-10.30
Cotton	-14.54	-28.42	-1.15	-21.96	-28.20	0.76	11.95	-3.87	10.98	26.30	3.83
Sugar	-4.78	40.25	42.53	20.10	5.83	7.08	-7.95	15.16	11.77	6.67	5.74
Pork	31.32	21.80	37.74	48.43	50.05	54.97	46.97	58.92	57.48	29.92	25.61
Beef	63.83	61.17	56.58	50.40	48.37	52.99	49.79	54.32	56.53	43.73	39.10
Mutton	41.36	26.11	30.52	31.90	14.13	33.77	19.87	28.42	32.56	22.29	17.22
Egg	-5.78	-15.44	4.87	12.49	-2.49	18.94	10.87	16.36	8.42	-3.54	-10.02
Honey	-10.41	-6.55	8.50	10.44	6.82	29.10	62.40	58.39	58.61	45.50	32.17
CSE's: using Asian unit export values as reference prices											
Rice	18.00	28.53	43.87	28.93	13.40	-2.31	12.78	8.68	12.23	27.77	10.71
Wheat	-9.77	-0.30	20.22	19.02	10.36	-5.73	24.42	26.09	1.29	-3.89	16.22
Corn	28.70	37.88	43.00	36.06	38.40	25.78	31.70	24.88	19.60	29.85	27.52
Soybeans	35.38	29.00	3.11	-4.46	-23.34	17.44	13.77	5.53	9.56	7.01	-2.44
Peanuts	41.19	48.11	69.81	58.35	52.76	64.86	62.28	60.65	65.62	48.86	44.54
Rapeseed	na	na	na	-14.59	-50.15	-2.55	22.49	-16.59	-3.02	14.72	3.63
Sesame	4.91	10.59	11.63	13.87	4.27	23.51	28.57	19.98	16.56	-28.27	-8.30
Cotton	-5.83	-22.30	3.14	-12.57	-10.38	16.49	26.86	11.41	9.91	30.70	4.11
Sugar	-27.81	22.92	34.16	16.21	-6.66	-1.56	-20.40	-5.79	2.67	-4.33	-6.16
Pork	27.82	22.21	31.03	49.32	45.84	50.27	49.62	62.20	60.30	36.01	27.93
Beef	42.79	19.56	13.86	10.82	12.62	13.56	19.22	27.74	20.87	3.94	15.34
Mutton	35.91	29.91	38.26	43.74	35.29	41.67	36.56	34.65	32.60	15.49	-0.36
Egg	-4.72	-12.70	4.76	24.49	15.77	26.49	18.30	35.17	25.30	18.27	3.26
Honey	-33.41	-22.13	-7.28	-6.80	4.27	17.30	37.85	38.54	35.13	34.18	15.47

PSE Estimates: Using Asian Export Unit Values

When Asian export unit values are used as reference prices, the PSE's are quite different from the ones calculated using Hong Kong import prices. Because Hong Kong prices are much higher than China's domestic producer prices, the PSE's indicate a tax on peasants. However, when the Asian export unit values are used, the indication is that increases in domestic procurement prices have surpassed the prices that China could get in international markets. The growth in agricultural trade has been slow in the 1980's. At the same time, many developed countries have continued to increase support to their producers, and large stocks have depressed trade prices. As a result, for many years in the 1980's, China provided support for the production of its staple goods, grains, and oilseeds (except peanuts).

Using the Asian unit export values as reference prices also shows the effects of the quality difference in the two different reference price series. This is most apparent for rice, which

helps explain why the export of China's rice is very limited despite its much lower price in the world markets. Because most rice produced in China is inferior-quality Indica rice, it receives a much lower price when exported than the higher quality rice imports to Hong Kong. The domestic price ratio of wheat to rice appears to be consistent with the Asian export unit values of wheat and rice. The government continues to tax peanuts and livestock producers, and sometimes corn producers as well.

CSE Estimates

Urban consumers of agricultural commodities, on the other hand, are protected from paying high prices at the expense of farmers. Urban consumers get a double shield from the government. First, border measures and transportation difficulties prevent farmers from exporting, forcing them to dispose of their products domestically at lower prices. Second, the government sells the farm products to urban residents, not only below free-market prices, but also substantially below

government procurement prices. Even at the much lower reference prices (Asian export unit values), CSE's are positive for most commodities over most of the period (table C-5).

The size of the urban subsidy depends on the commodity. Staples are subsidized more heavily than nonstaple goods. In 1986, prices of farm to nonfarm sales for food grains, oilseed crops, and meat were about 83, 57, and 4 percent higher than the corresponding urban subsidized prices (5). As the economy continues to expand, the resources used on farm production have more and more alternative uses. Thus, the opportunity costs of producing farm products increases. The discrepancy between the prices paid by urban residents and the farm's real costs of production increases. The government bears this cost.

However, the GOC is taking a very important step to reduce urban subsidies for rationed staple and nonstaple goods. Starting from May 1, 1991, wheat, rice, and corn prices were scheduled to rise about 54 percent. Prices of edible oils would increase from 1.6 yuan to about 4.4 yuan per kilogram (an increase of 160 percent). Individuals would receive an increase in wages of 6 yuan a month to offset price increases.

CSE's for most commodities over the last decade were positive under both alternative reference price series (table C-5), indicating that China supported the consumption of agricultural commodities. With the exception of oilseed crops, domestic consumers pay prices much lower than those in international markets. Using Hong Kong import prices as reference prices, the nominal rate of consumer protection for rice and pork in China averaged about 50 percent of world market prices. Rapeseed, sesame, and sugar occasionally had lower international prices than the domestic, urban subsidized prices. China's border measures effectively prevented its consumers from getting cheaper sources of oilseed crops.

Conclusions

China's procurement and urban subsidy policies have prevented prices from allocating resources efficiently. Over the reform period, China has had to increase procurement prices in order to stimulate sufficient production to meet urban commitments. By 1989, procurement prices for most agricultural commodities were more than double 1979 prices. In contrast, prices (in US\$ terms) for most agricultural commodities sold on world markets declined in the 1980's.

The PSE/CSE estimates presented here provide an indication of how China's policies have distorted incentives to producers and consumers of agricultural products. With a population of 1.1 billion, China is the world's largest producer and consumer of agricultural commodities. If China were to change its policies, it would have significant impact on world trade. The PSE/CSE estimates can be used for further studies to analyze the impact of China's policies on world trade.

The choice of a reference price is crucial in the calculation of PSE's/CSE's. Two sets of PSE/CSE estimates are calculated using two alternative reference prices--Hong Kong import prices and Asian unit export values. To the extent that the quality of agricultural products produced and consumed in China is

reflected in Asia's agricultural exports, Asian export unit values may be the most appropriate set of reference prices. Both sets of PSE's/CSE's, however, show that, without marketing reforms in urban areas, the GOC has to sacrifice efficiency in the allocation of resources in order to fulfill urban commitments. PSE's for many commodities in the late 1980's became positive, indicating growing costs from supporting the urban sector. The decision to eliminate urban food subsidies in May of this year indicates how burdensome these subsidies had become for the government.

References

1. An, Xi-Ji, "The Development and Improvement of Agricultural Marketing in China," in *China's Rural Development Miracle: With International Comparisons*, edited by J. Longworth, 1989, pp.19-25, University of Queensland Press, Australia.
2. Agricultural Yearbook Editing Committee, *China Agriculture Yearbook*, various issues (*Zhongguo Nongye Nianjian*, various issues in Chinese), Beijing, China.
3. China's State Statistical Bureau, *China Price Statistics*, 1988 (*Zhongguo Wujia Tongji Nianjian*), Beijing, China, 1988.
4. China's State Statistical Bureau, *China Rural Statistical Handbook*, various issues, (*Zhongguo Nongcun Tongji Nianjian*, various issues), Beijing, China.
5. China's State Statistical Bureau, *China Statistical Yearbook*, various issues, (*Zhongguo Tongji Nianjian*, various issues), Beijing, China.
6. Commercial Yearbook Editing Committee, *Almanac of China's Commerce*, 1988 and 1990 issues, (*Zhongguo Shangye Nianjian*, 1988 and 1990 issues), Beijing, China.
7. Customs General Administration of PRC, *Summary Surveys of China's Customs Statistics*, various issues, Beijing, China
8. FAO, "Government Interventions in Foodgrain Distribution in China," in *Government Interventions in Foodgrain Distribution in Selected Asian Countries*. Regional Office for Asia and the Pacific (RAPA), Food and Agriculture Organization of the UN, Bangkok, 1989.
9. FAO, *FAO Trade Yearbook*, various issues. Food and Agriculture Organization of the United Nations, Rome, Italy.
10. Tuan, Francis, *Major Agricultural Policy Changes in China in the Last Decade*, in *China: Agriculture and Trade*, Economic Research Service, U.S. Department of Agriculture, November, 1989.
11. Webb, Shwu-Eng H., "Agricultural Commodity Policies in China: Estimates of PSE's and CSE's, 1982-87," in *China: Agriculture and Trade*, Economic Research Service, U.S. Department of Agriculture, November, 1989.

China's Livestock Feed Industry

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Abstract: China's livestock feed industry has grown rapidly over the last 10 years as incomes have risen and demand for meat has increased. However, livestock sector development has put increased pressure on China's grain supplies. Even as total grain production has risen, releasing increased amounts of grain for feed use, low feed-efficiency levels are causing worry. The limited quantity and inconsistent quality of mixed and compound feed hinders the development of more efficient livestock operations. Caught between the competing demands for food grain and feed grain, China's Government is struggling to improve its livestock feed industry. The availability of manufactured feed as a share of total feed material remains quite low compared to most developed nations, despite some significant advances in the number of feed mills and increased production of mixed and compound feed over the last 10 years.

Keywords: China, feed industry, compound feed, mixed feed, feed additives and mixes, Ministry of Commerce, and Ministry of Agriculture.

China has experienced consistently rapid growth in livestock inventory numbers, slaughter rates, and total meat output throughout the 1980's. Rapid livestock sector development has been aided by significant increases in grain output. Total grain output rose from 332 million metric tons in 1979 to nearly 408 million in 1989, releasing increased quantities of grain for use as livestock feed. Additional gains have accrued from both central and municipal government investment in establishing or expanding modern livestock and feed operations near urban centers--in an effort to meet surging meat demand from city residents. As urban incomes have risen over the last decade, urban meat demand, particularly for higher quality, lean meats, has correspondingly risen. The new modern livestock operations and increased demand for leaner meats are putting pressure on the central and provincial governments to improve the quantity and quality of mixed and compound feed output.

This article reviews the development of China's livestock feed industry during the 1980's, with particular emphasis on the structure of the industry. A discussion of the different roles of the two government ministries responsible for overseeing feed production is included. Also, there is a review of the increase in output of the different types of feed over the last decade and a limited discussion of current feed utilization patterns.

China's Livestock Feed Enterprises

China's manufactured feed industry is organized under two distinct bureaucracies, the Ministry of Commerce (MOC) and the Ministry of Agriculture (MOA). MOC-controlled feed mills are generally larger, more modern, and located in or near urban centers. MOA-controlled mills are mostly small, rural operations. In at least one province, Heilongjiang, a separate Livestock Bureau has been spun off of MOA to manage the development of the livestock sector and feed enterprises (1).

Ministry of Commerce Feed Mills

MOC feed mills produce the bulk of China's compound feed. Since 1986, both the number and production capacity of MOC

feed enterprises has steadily increased. In 1986, the average mixed and compound feed produced by MOC feed operations was 4,314 tons. By 1989, the number of MOC feed mills increased and the average production per enterprise rose to nearly 5,417 tons (table D-1).

Table D-1--China's feed grain enterprises

	Total	MOC	MOA	Producing:	
				More than 10,000 tons	Less than 1,000 tons
Number					
1986	18,427	3,537	14,890	na	na
1987	13,354	3,817	9,537	30	na
1988	18,234	3,975	14,259	na	11,649
1989	15,791	4,021	11,770	90	9,329

Sources: 1983-90 China Economic Yearbook and 1985-90 China Agriculture Yearbook.

In addition to feed mills, the MOC also controls the national grain bureau system that is responsible for all state grain and oilseed procurement and distribution for the state. Therefore, MOC-controlled feed operations are more likely to have access to low-priced feed grains supplied through grain bureaus, giving them a significant competitive advantage over MOA operations. Furthermore, of the 21.8 million metric tons of mixed and compound feed produced by MOC mills in 1989, nearly 5.8 million tons were produced by grain and oilseed enterprises directly managed by China's grain bureaus. These mills, producing just over one-quarter of total MOC mixed and compound feed, are in an even better position to receive feed grain allocations from their parent grain bureau.

Even though some of these mills are not located on the same site with a grain bureau facility, they tend to be in close proximity, ensuring relatively cheap and easy access to grain

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supplies from the affiliated grain bureau. In 1989, the MOC increased feed grain allocations to its feed mills, allocations that, for the most part, would be at fixed or negotiated, rather than free-market, prices (2). In other words, many MOC-controlled feed mills can count on some portion of its grain to be supplied at subsidized prices, and count on a sure supply of grain due to their affiliation with the state grain bureau system.

Although national MOC policy calls for increasing feed grain allocations to feed mills, some provinces are trying to reduce their subsidy burden by requiring more feed grains to be purchased at negotiated, rather than fixed, prices. For example, in 1988 the Guangxi Provincial Government mandated that, except for dairy farms in the five municipalities administered directly by the central government, all of the grain department's feed grain allocations to mills would be at negotiated prices. Under the new program, the Guangxi provincial authorities claim to have reduced the annual quantity of feed grain sales at fixed prices by 30-40,000 tons (3). The Anhui Provincial Government announced that as of April 1, 1991, feed grains supplied to cities would all be at negotiated prices (4). And finally, Hebei Province announced that as of April 1, 1991, feed grains supplied to mills would be at negotiated, or even at market prices, rather than fixed prices (5).

If these changes spread to more provinces, which is likely given the increasingly difficult budget problems caused by the grain subsidy system, then MOC mills will lose at least a part of the advantage they have had over non-MOC mills. However, they will probably continue to be affiliated with the grain bureau distribution system, a significant advantage in grain-lean years.

MOA Feed Enterprises

Feed mills under MOA control include a few large operations, mostly under the China National Corporation of Animal Husbandry, Industry and Commerce (CNAHIC) and its affiliated enterprises. The bulk of MOA feed mills, however, are small operations producing simple mixed feed. Most are located at the prefecture level and below. A good deal of the mixed feed produced by these mills is of very low quality. In contrast to slow, but steady, growth in MOC feed mill numbers, MOA feed mills have fluctuated wildly over the last several years (table D-1). In 1985, the reported number of these small, mostly locally financed, mills increased by 2,859 from 1984 (6). With a total 1985 output of 1.45 million tons of assorted and mixed fodder, the average annual feed production of these new mills was only about 500 metric tons (versus an average production capacity of about 1,000 tons).

In 1987 and again in 1989, the number of reported MOA feed mills declined 36 and 17.5 percent, respectively. Although it can only be verified for 1989, it appears that most of the variability occurs among the smallest operations, those with an annual production of 1,000 tons or less. The relatively low hog/grain procurement price ratio in 1987 caused a drop in pig inventories (particularly reproductive sows) and slaughtered hogs, reducing feed demand (table 2) (7,8).

The 1989 decline in the number of reported mills was similar to 1987 in that the relatively decreased 1988 corn harvest (2.3 percent down from 1987's 77.4 million tons) resulted in rising

corn prices and a 16.5-percent decline in the hog/grain procurement price ratio (9). Excluded from access to the government's subsidized grain supplies and distribution network, small mills were forced out of operation by grain shortages or price hikes. Peasant household (those with a number of hogs) and specialized livestock household demand for feed are highly responsive to profit because of changes in the hog/grain price ratio, an important factor in the volatility of rural feed sales and, therefore, the continued operation of small MOA feed mills.

Table D-2--Hog/grain price ratio, 1979-89¹

	Price ratio	% change, prev year	Index
	Ratio	Percent	1979=100
1979	3.35	9.0	100.0
1980	3.49	4.1	104.1
1981	3.43	-1.6	102.4
1982	3.43	-0.2	102.2
1983	3.39	-1.2	101.1
1984	3.41	0.7	101.8
1985	4.38	28.2	130.5
1986	4.03	-8.0	120.1
1987	4.08	1.2	121.6
1988	5.74	40.7	171.1
1989	4.79	-16.5	142.9

¹ Derived from mixed-average procurement prices calculated by China's State Statistical Bureau using a weighted average of current fixed, negotiated, and free-market prices.

Source: Derived from data in the 1990 Statistical Yearbook.

A caveat is in order, however, concerning feed mill statistics. Some provincial officials believe that many of the smaller milling operations are not captured in MOA statistics, for instance small-capacity, diesel-powered hammer or burr mills run by individual entrepreneurs in village and town markets (10). This is supported by the fact that the official statistical reporting system only reaches down to the county level; enterprises at or above the township level are required to submit monthly statistical reports, while those below the township level are not (11).

The number of these unreported operations is impossible to estimate, but the combination of relatively low feed production numbers reported by the MOA, the limitations of the statistical reporting system, and a general impression given by China's agricultural officials that grain production is much higher than official statistics indicate, all suggest that published data on both the number of MOA feed mills and feed output might be grossly underestimated (12). This raises the question of whether the variability in MOA feed mill numbers might be explained by statistical accounting problems rather than as a response to input availability and price. Unfortunately, no firm evidence is available to support one position over the other.

China's Livestock Feed Production

Although China has not published an official statistical series on livestock feed production, some idea of the current state of the industry can be gleaned from various statistical yearbooks, press reports, journals and reports of discussions with agriculture officials. However, these statistics and observations must be taken with a grain of salt. As mentioned earlier, MOA feed production statistics probably significantly underreport true rural feed production. In addition, many rural households take their own grain to small local mills, then mix the milled grain with various other ingredients to produce a basic mixed feed (13). Some percentage, if not a majority, of these individual household feed production activities escape China's statistical reporting system. Given these weaknesses, the available data should only be taken as a general set of indicators for trends within China's feed industry.

Between 1982 and 1989 China's total reported compound and mixed feed production increased over 600 percent. These increases far outweighed increases in livestock inventory, suggesting an increased proportion of mixed and compound feed in total feed material. Area planted to fodder crops rose 19 percent between 1982 and 1989, while nongrain silage output more than tripled between 1985 and 1989 (table D-3).

Between 1986 and 1989, compound feed's share of total mixed and compound feed production was 50.4, 63.3, 50.0 and 60.0 percent, respectively. The variability is probably due more to

Table D-3--China's feed situation, 1982-89

	Non-grain silage	Area sown to fodder crops	Total mixed & compound feed ¹	Compound feed	Mixed feed
	Mil tons	1,000 ha	-----Mil. tons-----		
1982	na	1647	5.10	na	na
1983	na	1622	7.08	na	na
1984	na	1605	12.00	na	na
1985	9.88	1665	15.00	na	na
1986	13.09	1739	18.00	9.07	8.93
1987	22.00	1842	22.51	14.24	8.27
1988	22.00	1857	29.57	14.79	14.79
1989	28.89	1886	31.00	18.60	12.40
1982-89	134.80	--	140.26	na	na

-- = not applicable na = data not available

¹ Note that compound and mixed feed do not necessarily add up to the total. Also, in tables D-4 and D-5, MOC and MOA mixed and compound feed do not necessarily add up to the totals given here. This is likely due to using multiple sources, rounding error, and perhaps additives being included in some sources and not others. In general the differences are not large and do not appear to seriously compromise the data.

Sources: 1983-90 China Economic Yearbooks, 1985-90 China Agriculture Yearbooks, and Francis Tuan, "China's Feed Industry: Recent Development and Future Plans," China: Outlook and Situation Report, U.S. Department of Agriculture, ERS, July 1985, p. 32.

changes in the number of MOA-controlled mixed feed operations than to changes in either the amount of feed produced by those mills (note earlier discussion of MOA feed mill numbers) or fluctuations in MOC mill or production levels. In contrast to mixed feed, total compound feed output has grown steadily since 1986.

Very little information is available on how much of China's total grain production is actually used for livestock feed. Estimates have placed it around 20-30 percent, or about 100 million metric tons of the average 400-million ton total grain output in the late 1980's.

There is also very little information available on China's utilization of manufactured feeds. In 1983, of the 4.1 million tons of mixed and compound feed produced by the MOC, 60.5 percent was fed to hogs, 26.7 percent was fed to poultry, 2.75 percent was fed to cattle, and most of the rest was probably used as aquatic feed (14). Of the 18.6 million tons of 1989's total national compound feed production, 45 percent was used as hog feed, 40 percent was used as poultry feed, and the remainder was used as ruminant, aquatic, and other feed (15).

Assuming that MOC compound feed production in 1983 was only about 50 percent of the total MOC mixed and compound feed production, and recognizing that MOC compound feed was between 76 and 83 percent of total 1989 national production, it appears that the poultry industry's consumption of MOC-produced compound feed rose from around 1.0-1.5 million tons in 1983 to 7-9 million tons in 1989. These estimates correspond with the tremendous increase in China's poultry meat output during the same period. The growth in poultry meat production has mostly been provided by large, state-run operations situated near urban centers. As suggested previously, MOC feed mills are more closely linked to urban livestock operations. And, combined with the fact that the preponderance of MOC compound feed appears to be moving to state poultry farms, MOC feed mills are fairly closely linked to urban livestock, particularly poultry, operations.

Ministry of Commerce Feed Production

Total MOC feed output rose an average of more than 2 million tons annually between 1980 and 1989 (table D-4). By the mid-1980's, more than 50 percent of MOC feed mill output was compound feed. The gap between compound and mixed feed production has widened steadily. Compound feed production rose from 9 million tons in 1986 to 15 million in 1989, while mixed feed production stagnated at about 6 million tons. MOC compound feed output might have been even higher, but serious quality problems apparently prompted a great deal of post-production reclassification of compound as mixed feed.

Ministry of Agriculture Feed Production

The number of MOA feed mills has fluctuated over the last several years, but the compound and mixed feed production of these mills has not exhibited the same degree of variability. Statistics on MOA feed output are not available to compare with the 1987 decline in feed mills. Nevertheless, based on 1988 and 1989 production and feed enterprise data, some preliminary observations are possible.

Table D-4--MOC feed production, 1980-89

	Total ¹ from the MOC system	Compound ²	Mixed
	Million tons		
1980	1.10	na	na
1981	1.85	na	na
1982	3.00	na	na
1983	4.08	na	na
1984	na	na	na
1985	10.80	na	na
1986	15.50	9.41	6.09
1987	17.38	11.22	6.16
1988	22.19	15.56	6.63
1989	21.78	15.48	6.30

¹ See note for table D-3. ² Compound feed is frequently described as "good quality compound feed" (zhiliang jiaohao peihe siliao) in the China Economic Yearbook. The implication is that some of the compound feed produced is of such low quality that it cannot be included in compound feed production statistics. It is assumed that all feed not meeting the standards for compound is included in mixed. Only data identified as "good quality feed" is taken as compound feed.

Sources: 1983-90 China Economic Yearbooks, 1985-90 China Agriculture Yearbooks, and Francis Tuan, "China's Feed Industry: Recent Development and Future Plans," China: Outlook and Situation Report, U.S. Department of Agriculture, ERS, July 1985, p. 32.

Table D-5--MOA feed production, 1982-1989

	Total feed from the MOA system ¹	Compound			Mixed
		Total	CNCAHIC prod. ²	All other	
	Million tons				
1982	2.10	na	na	na	na
1983	3.00	na	na	na	na
1984	na	na	na	na	na
1985	5.18	na	na	na	na
1986	4.15	na	0.156	na	na
1987 ³	5.13	3.02	0.223	2.79	2.11
1988	7.38	4.65	0.339	4.31	2.73
1989	7.31	4.97	na	na	2.34

¹ See note for table D-3. ² China National Corporation of Animal Husbandry, Industry and Commerce and affiliated enterprises. ³ The total is from the 1989 Economic Yearbook. Another total 1987 production figure, 3.16 million tons, is given in the 1988 Yearbook. The 1989 number was used because it may be a revised figure.

Sources: 1983-90 China Economic Yearbooks, 1985-90 China Agriculture Yearbooks, and Francis Tuan, "China's Feed Industry: Recent Development and Future Plans," China: Outlook and Situation Report, USDA, July 1985, p. 32.

The number of MOA-controlled feed mills declined significantly in 1989, but the total amount of feed produced by these mills declined less than 1 percent (table D-5). Broken out by type of feed, however, compound feed production increased every year, albeit at a slower rate between 1987 and 1988. In contrast, and as expected, mixed feed production experienced a significant decline, falling more than 14 percent from 1988 production. All of this lends additional credence to the suggestion, discussed earlier, that MOA mixed feed mills are particularly vulnerable to changes in feed grain (and additive) supply and price. MOA compound feed mills, on the other hand, are probably larger operations, with some mills perhaps even integrated into the same system of subsidized grain allocation and distribution that supports the apparent stability in MOC-controlled feed mill production.

Nongrain Livestock Feed Components

Although 1989 mixed and compound feed production was over six times as large as in 1982, the majority of China's livestock feed continues to be a traditional mix of locally available materials. This is particularly true for individual rural household hog, ruminant and poultry production, where feed can include, but is not limited to, mixtures of weeds, vegetables, melons, alfalfa, clover, rye grass, soybean residue (from making bean curd), slaughterhouse offal, brewery waste, wheat bran, rice husks, sweet potatoes, sweet potato vines, stems and leaves, table scraps, and a variety of grains and oilseed meals, including corn, wheat, rice, barley, millet, sorghum, pulses (considered a grain in China), soybean meal, rapeseed meal, cottonseed meal, sunflowerseed meal and peanut meal (16).

Nongrain materials continue to make up a major portion of total feed mass. In Sichuan Province, for instance, officials estimate that only about 50 percent of feed mass is composed of grain and grain products. The rest continues to be drawn from whatever edible material is readily and cheaply available. The continued substantial share of nonmanufactured feed components in total livestock feed makes it clear that, for peasant households, cost and availability of feed grains continue to be serious constraints to greater feeding efficiency.

Feed grain supply can be a painful, though for many areas only periodic, bottleneck to feed production, while acquiring necessary feed additives is an ever-present constraint. For feed additives, low quantity and poor quality continue to hamper feed industry development despite the considerable progress in feed additive and mix production made over the last several years (table D-6).

In conjunction with government policy emphasizing poultry meat and beef production, pellet and ammoniated feed output has grown significantly over the last 4 years. MOC pellet feed production grew from 120,000 tons in 1986 to 1.23 million in 1989. There were no statistics reported for MOA pellet feed production, though it is unknown whether this indicates that MOA mills do not produce pellet feed or simply that no figures were published. Ammoniated straw output rose dramatically, increasing from only 40,000 metric tons in 1986 to 1.83 million in 1989. Production of other feed components and mixes also increased, though not as quickly as pellet or ammoniated feed. However, in 1989, MOC premix and concentrated feed output

Table D-6--China's feed additive and mix production, 1985-89

Year	MOC			MOA			
	Premix	Concentrated	Pellet	Premix	Concentrated	Additives	Ammoniated
1,000 tons							
1985	na	na	na	-----	116 -----	na	na
1986	11	46	120	na	na	na	40
1987	22	75	550	26	137	36	140
1988	37	127	980	65	204	143	1430
1989	35	100	1230	na	na	832	1830

Source: 1983-90 China Economic Yearbooks and 1990 Commerce Yearbook.

declined 5 and 21 percent, respectively, from 1989. This decline may have been part of the general 1989 slowdown in China's industrial sector, particularly in the state- and collective-owned enterprises, due to the severe credit squeeze imposed by the central government in response to rapidly increasing inflation.

Outlook for the 1990's: Continued Growth?

In 1985, China announced a comprehensive development plan for manufactured livestock feed through the year 2000 (17). It called for grain fed to livestock in 1990 to reach 100 million tons and mixed and compound feed production to reach 50 million tons. Although grain fed to livestock in 1990 has been estimated at about 100 million tons, mixed and compound feed output for 1989 was only 31 million tons. Initial estimates for 1990 feed production indicate that output stagnated at 31 million tons, little or no change from 1989 (18). By the year 2000, the plan calls for grain fed to livestock to reach 150 million tons and mixed and compound feed output to reach 100-120 million tons. Unable to reach the interim 1990 production target, it will be even more difficult for China to reach its target for the year 2000.

Although China's mixed and compound feed output has not increased as much as government planners had hoped, feed production nonetheless increased significantly throughout the 1980's. The central government's administrative and financial support was a contributing factor in that growth. That financial support is evident in two areas: MOC capital construction funding for new enterprises, and subsidized feed grain supplies. In recent years, the central government has also pressured provincial governments to support feed production and promote efficient feeding practices.

In 1987, the State Council directed that, over the next 3 years, the central government would provide funds equivalent to the difference between negotiated and fixed prices for 1.55 million tons of feed grains each year. These subsidies were targeted at major poultry, egg, and pork production operations in Beijing, Tianjin, and Shanghai municipalities and 10 other major pork-producing provinces (19). Some local governments also distributed quantities of feed grains at subsidized (fixed) prices

to support large-scale, hog-raising operations (20). The government announced that in 1991 it will subsidize prices for 3 million tons of grain used for feed and allocate funds to promote lean-pork production centers.

Although the government has announced a subsidy program for 1991, current central government fiscal problems have caused intense pressures to reduce subsidy expenditures, calling into question the government's ability to continue the subsidy program at the announced level. It has been estimated that the central government's 1991 budget deficit may reach 48.5 billion yuan, compared to only 6.8 billion yuan in 1985 (21). Therefore, through the mid-1990's, or at least until the deficit situation improves, central government fiscal support for increasing the availability and affordability of feed grains to feed enterprises may have to be scaled back.

Accordingly, for at least the next several years, the central government may find it difficult to subsidize any but the most critical municipal livestock operations that provide meat supplies to urban areas. Rural livestock production will, for the most part, continue to be managed in traditional ways and utilize primarily traditional feed mixes. However, assuming growth rates for manufactured feed grain production in the 1990's similar to those of the 1980's, manufactured feed utilization rates in rural areas should increase, albeit gradually. However, the increase will depend on advances in rural infrastructure to support that growth and peasants being willing to adopt the use of the feed. In the short-term, most of any marginal increase in the supply of higher quality manufactured feeds will contribute to meat production at large, urban livestock centers rather than in rural areas.

References

1. Frederick W. Crook, 1990 China Trip Report, USDA, Economic Research Service, p. 17.
2. 1990 China Economic Yearbook, p. III-47.
3. Liu Xingze, "Guangxi Reduces Scope of Grain Subsidies," Beijing Jingji Cankao (Chinese), December 11, 1990, in JPRS-CAR-91-017, March 26, 1991, p. 83.

4. "Anhui Reduces Scope of Grain Subsidies," Hefei Anhui Provincial Service (in Mandarin), March 31, 1991, in FBIS-CHI-91-066, April 5, 1991, p. 48.
5. "Hebei Cuts Supply of Low-Priced Grain, Edible Oil," Wuhan Hubei Provincial Service (Mandarin), March 23, 1991, from Foreign Broadcast Information Service Discard #65172.
6. *1986 China Agriculture Yearbook* (English), p. 20.
7. *1988 China Agriculture Yearbook* (English), p. 12.
8. Although the 1987 hog/grain procurement-price ratio was 1.2 percent higher than in 1986, it was still 7 percent lower than 1985.
9. *1988 China Economic Yearbook*, p. V-38.
10. Frederick W. Crook, 1990 China Trip Report, USDA, Economic Research Service, p. 18.
11. Christine Wong, "Interpreting Rural Industrial Growth in the Post-Mao Period," *Modern China*, Vol. 14, No. 1, January 1988.
12. Frederick W. Crook, 1990 China Trip Report, USDA, Economic Research Service, pp. 55-60.
13. Frederick W. Crook, 1990 China Trip Report, USDA, Economic Research Service, pp. 18, 55.
14. *China Economic Yearbook*, 1984, p. V-II.
15. *China Economic Yearbook*, 1990, p. III-46.
16. Frederick W. Crook, 1990 China Trip Report, USDA, Economic Research Service, pp. 7, 18; and Oilseeds and Products Annual Report, USDA, Foreign Agricultural Service, Report #CH1012, March 1, 1991.
17. Francis Tuan, "China's Feed Industry: Recent Development and Future Plans," *China: Outlook and Situation Report*, USDA, Economic Research Service, July 1985, p. 32.
18. "Commerce Ministry Reports Higher Fodder Production," *Beijing Xinhua* (English), February 4, 1991, in JPRS-CAR-91-008, February 14, 1991, p. 45.
19. *China Agriculture Yearbook*, 1988 (English), p. 12.
20. *China Agriculture Yearbook*, 1989 (English), p. 21.
21. Cheung, Tai Ming, "Purse Full of Holes," *Far Eastern Economic Review*, April 25, 1991, p. 46.

Chinese Shrimp Culture

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Abstract: China is the world's leader in the production of farm-raised shrimp. Chinese shrimp growers, assisted by a thorough, long-term government program and economic reforms, have massively increased harvests during the 1980's. In 1990, harvests declined from the record levels of 1988, but still exceeded 150,000 metric tons for the fourth straight year. China has led the world in both the total harvest of cultured shrimp and the production of artificially-reared shrimp seedstock since 1986. China's rapid increase in cultured shrimp production has been mainly based on the development of hatchery and pond management technology. The country's manpower resources are enormous and will be an important factor in the continued growth of the cultured shrimp industry. Shrimp culture has provided China a valuable export commodity with the majority of its exports going to Japan and the United States. Chinese growers, however, face a variety of pressing problems which may impede future expansion. This article is adapted from a recent National Oceanic and Atmospheric Administration, National Marine Fisheries Service report on Chinese shrimp culture.

Keywords: China, shrimp culture, harvests, species, government assistance, methods, feeds, yields, hatcheries, trade, U.S. imports, Japanese imports, future prospects.

Overview

Before 1950: Although shrimp culture in China is hundreds of years old, modern shrimp farming techniques have developed only recently. Before the 1950's, shrimp farming was primarily based on traditional methods of shrimp/fish polyculture. In Northern China, local species of shrimp and mullet were raised together. In Southern China, white shrimp, such as *Penaeus merguensis* (*P. merguensis*) and/or *P. penicillatus*, and grey mullet were stocked in ponds. Growers employed basic extensive methods. Juveniles and postlarvae were raised with inflowing water collected during high tides. During growout, nutrients consisted of what was present in the inflow water. Therefore, yield was low and inconsistent. Research was conducted to improve these traditional methods.

1950-1980: The Chinese Communist Government initiated limited research focusing on growing *P. chinensis* under controlled conditions beginning in the early 1950's. Chinese shrimp culture developed slowly before the mid 1970's, however, because of minimal government support and low profits (9). China actually succeeded in culturing shrimp for the first time in 1960, but did not begin to commercially raise shrimp until 1978. The transition from experimental to commercial harvest began in 1979, when a government shrimp culture enterprise was set up in the port city of Lianyungang (Jiangsu Province), on the Yellow Sea coast. About 1,250 metric tons of cultured shrimp were commercially harvested in 1979. Although some growers began to experiment with semi-intensive methods, most employed extensive methods during these early years. Shrimp were typically cultured in old salt ponds, coastal inlets, or natural ponds, and production per hectare was low. Polyculture with other fish species was the norm. One observer estimates that in 1976 only 7,200 ha were devoted to shrimp culture.

1980's: The Chinese Fisheries Bureau first succeeded in commercially culturing *P. chinensis* in the city of Tianjin (southeast of Beijing on the Bohai Coast) around 1980. After

this initial success, pond construction expanded rapidly. Cultured shrimp harvests also began to grow rapidly after 1983, when the area devoted to shrimp culture reached almost 20,000 hectares and harvests totaled about 9,000 tons. By 1988, the area under shrimp aquaculture had grown to over 240,000 hectares, with harvests of nearly 200,000 tons--increases of 1,200 percent and 2,200 percent respectively (table E-1).

Species

The most important cultured species in China is *P. chinensis* (also known as *P. orientalis* or Chinese white shrimp), a species adapted to cool, northern waters. This species is cultured primarily in the Yellow Sea and East China Sea coastal regions. The Chinese success with *P. chinensis* is an anomaly as other successful shrimp culture industries use tropical species. The Chinese industry is the only major shrimp culture industry conducted in temperate latitudes. *P. chinensis* accounts for the bulk of China's harvest--80-90 percent of the total. *P. chinensis* characteristically has a high-quality white flesh and grows to the large sizes preferred by most export markets. In addition to *P. chinensis*, tropical and subtropical species such as *P. japonicus* (kuruma prawn), *P. merguensis* (banana prawn), *P. monodon* (giant or black tiger prawn), and *P. penicillatus* (redtail prawn) are cultured in southern China.

Provinces

The provinces in China that harvest the greatest quantities of cultured shrimp are found along the country's 18,000 kilometer coast. *P. chinensis* prefer cooler water temperatures and are therefore cultured almost exclusively in the northern provinces around the Bohai Gulf and bordering the Yellow Sea--Liaoning, Shandong, Hebei, Jiangsu, and Zhejiang.

Northern China: In the north, shrimp are harvested in September, while in the central provinces, they are harvested at the beginning of October. The 4.5-month growing season, combined with low water temperatures in the northern regions, result in the harvest of mostly smaller-sized shrimp. The major size shrimp groups by quantity are 41/50, 31/40, 51/60, and 61/70.

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Table E-1--China's shrimp pond cultivation and shrimp production, total and selected major provinces, 1982-88

	1982	1983	1984	1985	1986	1987	1988
<hr/>							
Area: 1,000 hectares							
Total	16.5	19.8	33.4	59.5	85.0	131.0	242.0
Shandong	8.3	7.8	11.2	17.2	23.4	35.0	81.6
Liaoning	1.9	3.6	8.5	17.1	21.3	27.7	46.7
Hebei	1.0	1.8	3.1	5.9	9.7	14.0	26.6
Jiangsu	2.9	3.7	4.9	8.4	8.7	10.9	17.8
Fujian	.9	.7	1.2	2.9	7.0	14.2	22.2
Guangdong	.7	.2	2.2	2.0	5.1	16.1	24.1
<hr/>							
Production: 1,000 metric tons							
Total	7.0	9.4	19.3	40.6	82.8	152.9	198.7
Shandong	2.1	3.2	5.3	9.1	17.4	33.9	56.2
Liaoning	.7	1.8	6.0	11.9	24.5	43.5	40.7
Hebei	.04	.2	1.0	5.2	12.0	24.9	37.0
Jiangsu	2.1	2.3	3.5	5.9	8.4	11.8	13.3
Fujian	.2	.3	.4	1.7	6.2	13.3	20.6
Guangdong	1.5	.2	.9	2.8	4.4	11.6	15.1

Sources: 1982-87: The Culture of Cold Water Shrimp: Proceedings of an Asian-U.S. Workshop on Shrimp Culture, pp. 156-7. 1988: Bureau of Aquatic Products, Ministry of Agriculture, Beijing.

The climate in the north is temperate and the winter season is long and cold. Consequently, shrimp can only be cultured for 4-5 months of the year, a distinct disadvantage in comparison with other major shrimp-harvesting countries in Asia. This short growing season permits the harvest of only one crop per year. Shandong is the shrimp culture industry's key province in northern China, harvesting over 56,000 tons of cultured shrimp in 1988 (table E-1). This harvest accounted for over 25 percent of China's total 1988 cultured shrimp harvest and represents a spectacular increase from the negligible amounts harvested at the beginning of the decade. Liaoning Province was the next largest, harvesting over 40,000 tons of cultured shrimp. Hebei and Jiangsu Provinces produced approximately 37,000 tons and 13,000 tons, respectively, in 1988 (table E-1). The northern part of Fujian Province constitutes the southern biological limit for *P. chinensis*.

Southern China: The warm, southern coastal waters of the South China Sea are more suitable for the culture of tropical and subtropical shrimp species which characterize the shrimp culture industry in most other countries. Chinese growers in these areas, however, have made only minor progress in developing the region's potential. Growers in the southern half of Fujian, and all of Guangdong and Guangxi Provinces primarily harvest *P. merguensis*. However, *P. merguensis* are not differentiated from *P. chinensis* in southern China, and there is consequently much mixing of the two species when exported in block form. Although production is still small, *P. monodon* culture is increasing in the southern provinces, particularly Guangdong and Fujian. Large areas of the coast seem suitable for shrimp culture. The major limiting factor appears to be the availability of postlarval seedstock. This

suggests that China has significant potential to expand its shrimp harvests.

Government Assistance

Aquaculture

The startling growth in cultured shrimp harvests is the result of the Chinese Government's overall emphasis on aquaculture. Aquaculture is seen as the key to China's goal of raising fisheries output to 18 million tons by the year 2000. According to Chinese press reports, the government originally expected catch to increase by about 0.4 million tons yearly, primarily as a result of expanding aquaculture harvests. China has far exceeded this estimate since 1985, however, with its annual catch increasing by nearly 1.0 million tons each year. The 9.4-million ton catch in 1987 already exceeded China's 1990 goal of 9 million tons. China's 1990 catch is reported to be over 12 million tons, making China the world's largest fishing country.

Shrimp Culture Programs

Most of China's aquaculture research and promotion has been directed at expanding harvests of carp and a variety of low-value species for domestic consumption. Government planners, however, have also promoted shrimp culture to increase export earnings. Specific government measures to support shrimp culture include:

1. Playing an active role in accelerating development of the industry in its initial stages through planning, organizing, and coordinating various aspects, including production, processing, and trade.
2. Allowing foreign exchange earned from shrimp exports to be used by growers instead of turning it over to the state. In addition, shrimp products were tax exempt from 1979-1984.
3. Allocating more than \$20 million in grants and releasing a large sum of development loans at low interest rates during 1979-1985.
4. Initiating a highly respected national research program, with the cooperation of more than 10 institutes, universities, and farms. The research emphasizes seed production, feed and nutrition, diseases, and farm management systems. Extension work has also been strengthened to facilitate technology transfer (11).

Research Facilities

In China there are nine fisheries research institutes supervised by the Chinese Academy of Fishery Sciences. Of these, three are marine institutes, four are freshwater institutes, one is a machinery and instrument institute, and one is an engineering institute. Coordination of fisheries research is carried out through the Scientific and Technology Department of the Bureau of Aquatic Products, Ministry of Agriculture.

Major provinces and cities also have fisheries research institutes which conduct applied research, and are supervised by the

provincial or municipal bureau of aquatic products. For example, the Institute of Oceanology in Shandong Province is working on marine shrimp culture. The Yellow Sea Fisheries Institute is also working on marine shrimp culture and has a unit dealing with processing cultured harvests. In Shanghai, the East China Sea Fisheries Research Institute is actively pursuing studies in marine shrimp culture. At the Marine Hot Springs Aquaculture Development Center in Fujian Province, marine shrimp are maintained in geothermal waters under both experimental and production conditions. Research on freshwater prawn culture is taking place at the Freshwater Aquaculture Institute in Fujian Province (1).

Many shrimp growers are currently requesting that scientists provide them with new species with high growth rates, disease resistance, and adaptability to various environmental conditions. Therefore, experiments on breeding new varieties by hybridization or sex control (all female shrimp breeding) are now being conducted. Scientists are attempting to identify shrimp species which grow rapidly at high densities to maximize yields. Scientists are also conducting various artificial breeding experiments on those species to improve yields.

Chinese researchers paid little attention to shrimp diseases until the mid-1980's because diseases were limited to certain areas and losses were not serious. Disease losses are now mounting. In addition, growers note the problems experienced in Taiwan, Thailand, and other countries. The government has conducted shrimp-disease surveys in most coastal provinces, particularly in southern China. Disease tends to be more prevalent in southern provinces because water temperatures are higher. Microbiological studies have been carried out and methods for disease control have been developed. Studies on viral and fungal diseases are now beginning (9).

Management Reforms

Major reforms of China's state-controlled economy have helped promote the shrimp culture industry. One of the most important is the fishery contract responsibility management system. Under this system, the government retains title to ponds and infrastructure, but contracts with a group of households, a single household, or an individual, for specified production at a given price. After fulfilling their government contract, contractees are permitted to keep profits from sales of any remaining production. Many villages and households have become very wealthy through shrimp culture. The average revenue per pond hectare was about \$1,800 in 1987. Other important reforms included a liberal production policy which allows farm households to control procurement of farm inputs and marketing of the product, and relaxation of the conditions for the purchase and marketing of aquatic products.

The Chinese Government is currently providing further financial backing for increases in fisheries production, especially in aquaculture. The government has approximately \$29.6 million for the development of the fishing industry and the construction of processing plants, technical renovation, and fish feed production. The Chinese Government hopes to double aquaculture harvests every 3 years. Consequently, pond construction is underway in most coastal areas. The government has also permitted joint ventures with foreign

investors to obtain needed capital. One example is an agreement with Thailand's agribusiness giant, the Charoen Pokphand Group (CP). CP is preparing major shrimp joint ventures in Hainan, China, modeled after its farms in Thailand. CP will provide needed credits and shrimp seedstock to Chinese growers on a contract basis.

Methods

Shrimp growers use three major methods: (1) extensive, (2) semi-intensive, and (3) intensive. Extensive farming is a traditional method. Ponds are generally 10-100 hectares in size and water exchange depends on natural tidal fluctuation. Output with this method is low, generally 0.2-0.3 tons per hectare. Intensive culture offers higher yields (as much as 7-10 tons per hectare), but the high cost of pumps and energy has limited the use of this technique. Consequently, most shrimp growers in China use semi-intensive methods. This technique employs ponds with a size of 3-4 hectares in area, and 1-2 meters in depth. The average stocking rate in semi-intensive shrimp ponds ranges from 150,000-300,000 post-larvae per hectare. To improve water quality, water pumps are widely used to move seawater during weak tidal periods. Windpower is generally used to aerate semi-intensively cultured ponds, but air blowers and paddles were introduced in the late 1980's (2).

The methods employed in China vary with region and species. In Northern China, the growout ponds of most shrimp farms are earthen, typically 2 to 10 hectares in size and 1.5 to 2 meters deep. Most ponds in Hebei and Liaoning Provinces are small (2-3 hectares), constructed in the 1980's, and equipped with pumping systems for water exchange. The growout ponds here are bigger than those found in Southeast Asian countries and the operation is mainly semi-intensive. Farther south in Shandong and Jiangsu Provinces, shrimp ponds are larger (4-7 hectares) and usually not more than 1 meter deep. Most are equipped with pumping systems rather than aerators. A few extensive ponds there are very big (over 20 hectares) (9).

Conditions are favorable for tropical shrimp culture in southern China, especially Guangdong Province. Currently, Guangdong's extensive culture farms harvest about 0.5 tons per hectare, while the semi-intensive farms produce about 0.6-0.8 tons per hectare. Shrimp culture in Guangdong is generally practiced on a small scale. While ponds in other parts of China may be as large as 10 hectares, the Guangdong Province Fishery Development Corporation builds shrimp ponds with an average size of 0.6 hectares, allocating one pond to each family. The family takes total financial responsibility for the shrimp culture operation and sells its output to the corporation at a fixed price.

Feeds

Chinese production costs are touted as the lowest in the world (about \$2 per kilogram) with shrimp feed representing 50-75 percent of total production costs. Most shrimp feeds in China consist of trash fish and marine shellfish, combined with formulated feeds at small mills. Mussels and blue clams are often used as a supplemental feed. Other feeds utilized are earthworms, insects, small shrimps and crabs, and peanut or soybean cake. Formulated shrimp feed, made from a mixture

of fish meal, yeast, activated starch, and a number of other agricultural byproducts, has a much higher feed/flesh conversion ratio than peanut/soybean cake or trash fish--3/1 versus 4/1 and 12/1, respectively. The main drawback is the relatively high cost of the formulated feeds.

China's need to expand and improve feed production has resulted in efforts to form joint ventures with important foreign feed companies. The Norwegian Trouw International Corporation opened the first of several planned shrimp feed mills in China during August 1989. The mill will operate under the name Sulandlink and is a joint venture between Trouw, the Jiangsu Company of China, and Paclink of Hong Kong.

Yields

Chinese growers made great progress in increasing average yield during the mid-1980's, from slightly more than 0.4 tons per hectare in 1982 to about 1.2 tons in 1987. Average yield dropped to 0.8 tons per hectare in 1988, however, indicating yield increases may be levelling off. Average yields differ markedly between the various coastal provinces. Of the major shrimp-producing areas, Hebei Province in 1988 had the highest yield, averaging 1.4 tons per hectare. Liaoning and Fujian Provinces were second with yields of 0.9 tons per hectare. Other provinces report comparatively low yields, particularly southern provinces such as Guangxi and Guangdong, because of the predominance of extensive farms. Efforts to increase yields are organized largely at the provincial level.

Hatcheries

China had no commercial shrimp hatcheries throughout most of the 1970's. Before 1978, shrimp growers relied on wild post-larvae (pl) for seedstock. As a result, the pl supply was affected by unpredictable environmental factors, and the cultured shrimp harvests fluctuated annually. The shrimp culture industry underwent a dramatic change in 1978 when the first successful hatchery opened and began to supply pl on a regular basis to farms.

Recent reports estimate that there are nearly 300 Chinese shrimp hatcheries supplying pl from 70-percent-wild and 30-percent-captive females. The Chinese Government, to protect natural stocks, required that all seed stock be produced from captive females by the end of 1990. As a result, joint ventures are being encouraged to increase the supply of pl. An example is the Zhousan Second Fishery Corporation in Zhejiang Province which established a joint venture with Japan's Taiyo Fisheries Company in 1986. The venture produced 10 million shrimp pl for Zhejiang ponds during the first year of operation.

Chinese hatcheries use two main methods to produce pl seed-stock. In the first, fishermen collect mature spawners on fishing grounds. After delivery to the hatcheries, the pl are produced within a few days. This is the main source of seedstock in Northern China. The advantage of this method is that it avoids the expense of building a sophisticated maturation hatchery. However, it leaves the farmers subject to the same environmental and climatic fluctuations affecting pl availability in the wild.

A second source of seedstock consists of broodstock taken from the wild or reared in ponds. In the north, healthy adult shrimp of both sexes are selected and kept in controlled-temperature nursery ponds. The artificially controlled conditions allow them to mature between February and April in the cold northern climate. In the south, the natural water temperature is high enough to permit broodstock to be held in outdoor nursery ponds. As a result, this method is much more widely used in the south than in the north.

The Chinese Government operates most hatcheries. Almost all of them are relatively large facilities capable of producing hundreds of millions of pl annually. During the late 1980's a few private groups opened hatcheries modeled after backyard hatcheries in Thailand. Because of a lack of necessary knowledge and hatchery techniques, these private owners often invite technicians or experts from Chinese fisheries research institutions to be their technical consultants.

Large rearing tanks (10-50 cubic meters) and high densities (100-200,000 pl/cubic meter) are generally used in northern and southern China. For climatic reasons, all hatchery facilities in the northern provinces are indoors. The hatching season extends from April to early June in Liaoning, Hebei, Shandong, and Jiangsu Provinces. In contrast, in Hainan and Guangdong Provinces, most of the facilities are outdoors and have a longer hatching season (February to July). *P. chinensis* larvae are raised in the early part of the season and *P. merguensis* larvae are cultured in the latter part of the season (2).

Marketing

China in 1982 was only a minor participant in the international shrimp market, but it has now become the world's leading exporter. China is the principal exporter of shrimp to the United States and the second largest exporter to Japan, benefiting from the collapse of Taiwan's production in 1988. These declines have created important opportunities in both the U.S. and Japanese markets. The United States and Japan accounted for nearly 90 percent of China's shrimp exports in 1988 (table E-2). China exported an estimated 98,200 tons of shrimp in 1988, valued at nearly \$600 million--about 60 percent of the total value of China's fishery exports for the year.

Table E-2--China's shrimp exports by volume, 1984-1989

	1984	1985	1986	1987	1988	1989	1990
	Metric tons						
U.S.	1,468	3,142	9,373	19,241	47,317	46,717	57,439
Japan	10,307	10,664	18,723	27,898	38,122	37,568	43,571
Other	5,325	5,594	12,904	12,961	12,761	na	na
Total	17,100	19,400	41,000	60,100	98,200	na	na

na = not available.

Sources: Japanese Imports of Marine Products, Japan Marine Products Importers Association, 1980-1988; Japan's Exports and Imports: Commodity by Country, Vol. 89/12; Bureau of the Census.

Chinese shrimp exports were controlled by the China National Cereals, Oils, and Foodstuffs Import and Export Corporation until the mid-1980's. Economic reforms have now given provincial corporations the power to export directly. This has opened the door for additional firms wanting to export, but has also pitted the Chinese ministry responsible for foreign trade against the provincial trading firms and manufacturers allowed to trade with foreigners. The shrimp culture industry was given a powerful impetus when the government decided to allow exporters to keep a percentage of their foreign exchange receipts.

Processing

China has about 1,400 shrimp processing plants. They process both captured and cultured shrimp as well as other aquatic products. These plants have a freezing capacity of 1,800 tons per day and a cold storage capacity of 53,600 tons. Shrimp processing plants and cold storage facilities are located near farms or fishing harbors. Head removal, peeling, quick freezing, packing, and cold storage are all completed in the plants. Most of the processing plants have icemaking capability. Processed headless shrimp are usually packed as 2 kg frozen blocks.

Seasons: China's shrimp harvest is processed for export primarily in the last quarter of the year because both the important northern cultured harvest and the wild-shrimp fishing seasons occur at this time (12). Because of the lack of cold stores, the policy in the past has been to ship the shrimp to export markets as quickly as possible. Releasing such a large amount of shrimp at one time has adversely affected market prices, not only for Chinese shrimp but also for shrimp from other countries. This problem is becoming less important as China builds more cold storage facilities and develops the ability to spread out export shipments and temper price fluctuations.

Brands: Chinese exporters ship shrimp under only a few brand names. Each brand may be used by a large number of different processing plants. The practice has impaired China's ability to improve product quality. Most managers have little incentive to produce better quality packs when there are no price incentives for their efforts. Cultured shrimp are marketed in the United States under the brand names "Triple A" and "Sea Brand," whereas wild-harvested shrimp are packed under the "Sea Swallow" and "Billow" brands.

Quality Control: Government regulations ensure quality control at processing plants. Specific stipulations regarding quality control are drawn up in each province or city. Local units managing aquatic product exports use two methods of quality control. One method uses inspectors who travel from plant to plant, while the second stations inspectors at designated plants. Every shrimp processing plant must be registered at the National Bureau of Commodity Inspection, which is responsible for issuing licenses after inspecting plant equipment and sanitation. The quality of shrimp processing varies significantly from plant to plant. Problems include limited processing capacity, outdated processing equipment, and undereducated workers. In particular, plants whose output has been transferred from domestic to foreign markets have difficulties adjusting to the higher standards of the export market (3).

The Domestic Market

China's domestic shrimp market has changed substantially. Before 1985, only about 30 percent of the cultured shrimp harvest was consumed domestically. The remainder was exported because of its high foreign exchange value. Once the system of state control over the procurement and marketing of shrimp was abolished in 1985, domestic sales increased sharply. In 1988 China's shrimp growers marketed about 50 percent of their pond harvests in domestic markets.

Shrimp is usually dried for local consumption. China has a limited domestic cold-storage network, and few consumers have home freezers. Annual domestic shrimp consumption in 1988 was about 110 grams per capita. The domestic market could become increasingly important in the future as incomes and living standards improve, particularly in urban coastal areas.

Export Markets

Japan: China's exports of cultured shrimp to Japan have increased significantly over the past 5 years. Chinese shrimp exports made a fairly major breakthrough in 1988 when the Taiwanese *P. monodon* ("black tiger prawn") crop failure occurred. Heavy imports of *P. chinensis* from China compensated for the shortage of *P. monodon* on the Japanese market. It should be noted, however, that Chinese exports, as well as exports from other countries, levelled off in 1989 because of a drastic price drop resulting from oversupply and reduced demand following the death of the Japanese Showa Emperor. Chinese exports rebounded in 1990 to 44,000 tons, over four times the 1985 amount (table E-2). In 1990, China advanced to second place, behind Indonesia, in the Japanese market as demand returned to pre-1989 levels.

The "trade fairs" purchasing system has traditionally set the Japanese market price for Chinese shrimp. The three most important fairs for the Japanese market are held in Guangdong, Beijing, and Tokyo. Partly because of increasing shrimp production, China is modifying this system. The Guangdong Trade Fair, held biannually (spring and fall), has become less important, while quantities of shrimp contracted at the Beijing and Tokyo Trade Fairs have increased. The latter two trade fairs, previously limited in number, have become monthly events in order to facilitate China's export strategy.

United States: China initiated significant exports of *P. chinensis* to the U.S. market in 1985. Because traditional shrimp exporters such as Mexico could not meet increasing U.S. demand, U.S. importers increasingly turned to China and other countries, especially as Chinese official prices are below other major suppliers. China overtook Mexico and Ecuador as the foremost shrimp supplier to the U.S. market in 1988. China's total exports of shrimp to the United States rose dramatically between 1985 and 1990, from only 3,100 tons to more than 57,000 tons (table E-3).

Shell-on frozen shrimp products comprised the vast majority of Chinese exports to the United States until the late 1980's. Peeled shrimp products have now grown to nearly 25 percent of Chinese exports to the United States. Until 1989, India had been the largest frozen peeled-shrimp supplier to the U.S.

Table E-3--China's shrimp exports to the United States, by volume and value, 1984-1990

	1984	1985	1986	1987	1988	1989	1990
1,000 metric tons							
Shell on: Fresh/frozen	997	2,629	6,401	10,561	36,740	-	-
Frozen *	-	-	-	-	-	34,287	40,932
Fresh *	-	-	-	-	-	175	37
Peeled: Raw, fresh/frozen	334	422	2,798	7,158	7,759	-	-
Other, fresh/frozen	115	80	167	1,211	2,720	-	-
Frozen *	-	-	-	-	-	11,794	16,202
Fresh *	-	-	-	-	-	24	134
Canned	14	11	7	310	98	-	-
Breaded	8	-	-	1	-	1	-
Other preparations *	-	-	-	-	-	436	134
Total	1,468	3,142	9,373	19,241	47,317	46,717	57,439
\$1,000							
Shell on: Fresh/frozen	9,669	17,905	48,183	73,383	241,235	-	-
Frozen *	-	-	-	-	-	212,671	268,846
Fresh *	-	-	-	-	-	1,453	201
Peeled: Raw, fresh/frozen	2,191	2,740	13,370	37,718	40,444	-	-
Other, fresh/frozen	440	591	973	6,630	17,681	-	-
Frozen *	-	-	-	-	-	59,528	84,515
Fresh *	-	-	-	-	-	70	505
Canned	21	55	8	1,183	682	-	-
Breaded	67	-	-	-	-	3	-
Other preparations *	-	-	-	-	-	2,987	1,039
Total	12,388	21,291	62,534	118,914	300,042	276,712	355,106

* New commodity categories starting in 1989. Commodity codes and classifications changed when the U.S. switched from the Tariff Schedules of the U.S. Annotated (TSUSA) to the Harmonized Tariff Schedule (HTS) in 1989.

Source: U.S. Department of Commerce, Bureau of the Census.

market. Low labor costs have enabled China to increase the added value component of its exports and thus make shrimp exports to the United States even more profitable (note that shrimp imported into the United States are classified as nonagricultural imports by the Department of Commerce).

Europe: Chinese shrimp exporters have only recently entered the European market. Previously, sporadic purchases took place via Hong Kong when European buyers were not accustomed to direct trading with China. China's trade liberalization policy, however, has helped change this trend.

China currently exports shrimp to the United Kingdom, Spain, Italy, Belgium, and Germany. Most of these exports are channeled through Hong Kong. Direct purchases from farms are decreasing as trading companies now take care of bulk orders. Trading companies also help to insure product quality. Spain and Belgium take mostly head-on product, while Germany, Italy, and the United Kingdom take head-off and peeled product.

The most dramatic increase has been reported by the United Kingdom, with exports increasing 25 percent during the 1986-

1988 period. Here as well, demand for value-added, peeled shrimp products has been especially strong.

Prospects

There is great potential for continued shrimp culture development in China. Only about a quarter of the 8 million hectares of water area available there for aquaculture is currently under cultivation. The industry is still centered in the north, where yield potentials are relatively low. Only limited development of the significant potential of southern China has yet occurred. Despite the remarkable growth in China's shrimp aquaculture industry, many problems remain to be resolved as the country attempts to expand shrimp harvests. The most pressing problems include:

1. Pollution: sewage from cities and farm chemicals contribute to red tides and disease epidemics that strike shrimp farms.

2. Infrastructure: lack of the basic infrastructure necessary for shrimp production (e.g., electricity, roads, aquaculture equipment) fundamentally hinders China's ability to increase cultured shrimp output.

3. **Seedstock:** seedstock supplies are still highly seasonal. Although hatcheries have alleviated the pl problem, hatchery methods need improvement. With the use of wild spawners to be discontinued in 1990, further expansion of the industry will depend on improved hatchery operations.

4. **Feed:** the high cost of feed is a critical problem for the industry. Because feed is the leading cost on most farms, development of a better-formulated and cost-effective feed is necessary.

All of the above problems have led some industry observers to doubt the realism of China's future production goals. These observers argue that until these problems are alleviated, China will not be able to achieve major harvest increases.

References

- (1) Baluyut, Elvira, *A Regional Survey of the Aquaculture Sector in East Asia*, UNDP, FAO, Rome, 1989, pp. 38-39.
- (2) Chen Jiaxin, "Shrimp Culture in the People's Republic of China," *The Culture of Cold Tolerant Shrimp: Proceedings of an Asian-US Workshop on Shrimp Culture*, The Oceanic Institute, Honolulu, Hawaii, 1990, pp. 72-73.
- (3) Feng Cen, "Shrimp Situation in China," *Proceedings of Shrimp World IV*, November 5-9, 1989, pp. 172-73.
- (4) *Fish Farming International*, December 1989.
- (5) *Fisheries Circular No. 822: Reform and Development of China's Fisheries*, Food and Agriculture Organization of the United Nations (FAO), Rome, June 1989.
- (6) *GLOBEFISH Highlights*, 2/89, 3/90.
- (7) *Infofish International*, March 1990.
- (8) Liao, Paul, "Development and Potential for Shrimp Aquaculture in the People's Republic of China," *Proceedings of Shrimp World III*, November 8-12, 1987.
- (9) Liu Ruiyu, "Present Status and Future Prospects for Shrimp Mariculture in China," *The Culture of Cold Tolerant Shrimp: Proceedings of an Asian-US Workshop on Shrimp Culture*, The Oceanic Institute, Honolulu, Hawaii, 1990, pp. 17-18, 22, and 25.
- (10) *Quick Frozen Foods International*, April 1989, January 1990.
- (11) Shang, Yung C., "Marine Shrimp Farming in PR China," *Infofish International*, February 1989, p. 16.
- (12) The World Bank, "China Country Brief," pp. 253-55, *Asia-Wide Shrimp Agro-Industry Sector Study*, Draft Final Report, April 1989.
- (13) *World Shrimp Farming*, various issues.

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Appendix table 1--China's grain area, yield, and production, 1986-90¹

Unit	1986	1987	1988	1989	1990
Million hectares					
Sown area					
Wheat	29.62	28.80	28.79	29.84	30.80
Rice	32.27	32.19	31.99	32.70	33.10
Coarse grains	27.91	28.72	28.25	28.21	29.09
Corn	19.12	20.19	19.69	20.35	21.40
Sorghum	1.88	1.86	1.79	1.63	1.55
Millet	2.98	2.69	2.51	2.40	2.28
Barley	3.36	3.40	3.70	3.28	3.30
Oats	0.57	0.58	0.56	0.55	0.56
Potatoes	8.69	8.87	9.05	9.10	9.10
Others ²	12.44	12.62	11.98	12.06	11.45
Total ³	110.93	111.22	110.12	112.21	113.50
Tons/hectare					
Yield ⁴					
Wheat	3.04	2.98	2.99	3.04	3.18
Rice	5.34	5.41	5.29	5.51	5.59
Coarse grains	3.12	3.34	3.34	3.31	3.64
Corn	3.71	3.92	3.93	3.88	4.16
Sorghum	2.87	2.91	3.14	2.72	3.35
Millet	1.52	1.69	1.76	1.57	1.93
Barley	1.68	1.78	1.67	1.74	1.73
Oats	1.04	1.10	1.19	1.20	1.21
Potatoes	2.92	3.18	3.01	3.00	3.30
Others ²	1.36	1.45	1.51	1.31	1.36
Total ³	3.53	3.62	3.63	3.63	3.83
Million tons					
Production					
Wheat	90.04	85.84	85.43	90.81	98.00
Rice	172.22	173.88	169.11	180.13	185.00
Coarse grains	87.01	95.80	94.21	93.47	105.98
Corn	70.86	79.15	77.35	78.93	90.00
Sorghum	5.38	5.43	5.59	4.44	5.20
Millet	4.54	4.54	4.41	3.75	4.40
Barley	5.63	6.04	6.18	5.69	5.70
Oats	0.60	0.64	0.67	0.66	0.68
Potatoes ⁵	25.34	28.22	27.23	27.30	30.00
Others ²	16.90	18.30	18.11	15.84	16.02
Total ³	391.51	402.04	394.41	407.55	435.00

¹ Data are official figures released by the SSB or the Ministry of Agriculture, except for: (1) 1990 total and individual coarse grain production; and (2) 1990 barley and oats, and other grain area and production.

² Consists of soybeans, pulses, and other miscellaneous grains. All of these items are included in China's definition of total grains.

³ PRC definition.

⁴ Calculated from area and production figures.

⁵ Converted to a grain-equivalent weight using a 5:1 conversion ratio.

Source: China Agricultural Yearbooks, 1986-90; China Statistical Yearbooks, 1986-90; and the 1991 China Statistics Abstract.

Appendix table 2--China's 1990 provincial grain, cotton, oilseed, sugar crop, and red meat production

Province	Grain	Cotton	Oilseed	Sugar crop	Red meat
			1,000 tons		
Northeast:					
Heilongjiang	23,125	0	172	6,320	460
Liaoning	15,000	14	175	498	788
Jilin	20,465	0	467	1,164	433
North:					
Shandong	34,800	975	2,121	50	1,870
Hebei	22,769	571	749	123	1,213
Beijing	2,520	3	31	0	204
Tianjin	1,800	15	47	0	101
Henan	33,037	676	1,523	101	1,237
Shanxi	9,690	112	394	432	239
Northwest:					
Shaanxi	10,000	78	334	59	445
Gansu	6,866	8	337	724	375
Nei Monggol	9,730	0	694	2,356	501
Ningxia	1,880	0	62	478	63
Xinjiang	6,769	469	390	2,244	278
Qinghai	1,145	0	120	8	152
East:					
Zhejiang	15,400	64	483	628	856
Jiangsu	32,642	464	1,124	223	1,584
Shanghai	2,395	12	182	7	236
Anhui	24,572	236	1,291	88	976
Central:					
Hubei	24,200	517	958	347	1,373
Hunan	26,927	120	722	1,278	1,895
Jiangxi	16,582	57	549	1,943	1,025
South:					
Guangdong	18,963	0	563	17,528	1,351
Guangxi	14,026	0	230	12,542	795
Fujian	8,846	0	177	3,443	641
Hainan	1,650	0	45	3,715	121
Southwest:					
Sichuan	42,660	115	1,556	2,405	4,073
Guizhou	7,250	1	439	209	713
Yunnan	10,612	0	133	6,623	748
Xizang	560	0	17	0	90
Total	446,830	4,508	16,132	72,146	25,134

Source: 1991 Statistics Abstract; and 1990 Statistical Yearbook.

Appendix table 3--China's oilseeds and cotton area, yield, and production, 1985-89

Item	1986	1987	1988	1989	1990/1
Sown area: 1,000 hectares					
Cotton	4,306	4,844	5,535	5,203	5,600
Oilseeds, USDA ²	21,877	22,431	21,434	21,929	17,400
Soybeans	8,295	8,411	8,120	8,057	7,600
Oilseeds, PRC ³	11,415	11,181	10,619	10,512	11,600
Peanuts	3,253	3,022	2,914	2,946	2,900
Rapeseed	4,916	5,267	4,936	4,993	5,500
Sesameseed	1,007	869	704	722	700
Sunflowerseed	1,107	887	830	716	700
Other oilseeds ⁴	1,132	1,136	1,135	1,140	1,800
Yield: Kg/hectare					
Cotton	824	877	750	731	805
Oilseeds, USDA ²	1,301	1,370	1,235	1,200	1,863
Cottonseed	1,398	1,490	1,274	1,240	1,369
Soybeans	1,400	1,482	1,434	1,270	1,346
Oilseeds, PRC ³	1,291	1,366	1,243	1,220	1,391
Peanuts	1,808	2,042	1,954	1,793	2,196
Rapeseed	1,196	1,254	1,021	1,090	1,265
Sesameseed	614	605	574	592	670
Sunflowerseed	1,395	1,399	1,420	1,486	1,714
Other oilseeds ⁴	718	647	781	605	
Production: 1,000 tons					
Cotton ⁵	3,549	4,246	4,149	3,788	4,508
Cotton (1,000 bales) ⁵	16,300	19,500	19,100	18,000	20,705
Oilseeds, USDA ²	30,939	33,698	30,615	28,450	32,420
Cottonseed	6,018	7,217	7,053	6,440	7,664
Soybeans	11,614	12,465	11,645	10,230	10,230
Oilseeds, PRC ³	14,738	15,278	13,203	12,820	16,132
Peanuts	5,882	6,170	5,693	5,360	6,368
Rapeseed	5,881	6,605	5,040	5,440	6,958
Sesameseed	618	526	404	340	469
Sunflowerseeds	1,544	1,241	1,180	1064	1,200
Other oilseeds ⁴	813	735	886	690	2,806
Edible veg oil ⁶	4,534	4,870	5,029	5,241	na
Available meal ⁶	7,648	8,618	7,147	7,317	na

¹ Figures for sunflowerseed and other oilseeds are USDA estimates. ² Oilseed data published by USDA include only soybeans, cottonseed, peanuts, rapeseed, and sunflowerseed; area includes cotton. ³ China's total oilseed data exclude soybeans and cottonseed. ⁴ "Other oilseeds" are calculated as a residual and include mainly huma (an edible oil-bearing flaxseed) and castor beans; oil-bearing tree seeds are excluded. ⁵ Cotton production is on a ginned-weight basis. Bales are 480 pounds. ⁶ Available oil and meal are estimated by USDA for the marketing year following harvest by applying assumed crush and extraction rates to production plus net imports. Edible vegetable oil excludes linseed oil.

Source: China Statistical Yearbook, 1986-90; China Agriculture Yearbook, 1982-90; and 1991 China Statistics Abstract.

Appendix table 4--China's yearend livestock inventories and product output,
1986-90

Item	1986	1987	1988	1989	1990
Million head					
Yearend inventory:					
Hogs	337.19	327.73	342.22	352.81	362.41
Large animals	118.96	121.91	125.38	128.05	130.21
Draft animals	69.05	71.13	72.19	74.32	76.06
Cattle	91.67	94.65	97.95	100.75	102.88
Dairy cows	1.85	2.16	2.22	2.53	na
Water buffalo	20.41	21.50	21.65	21.40	na
Horses	10.99	10.69	10.54	10.29	10.17
Mules	10.69	10.84	11.05	11.14	5.49
Donkeys	5.11	5.25	5.37	5.39	11.20
Camels	0.50	0.48	0.47	0.47	0.46
Sheep	99.01	102.65	110.57	113.51	112.82
Goats	67.22	77.69	90.96	98.13	97.20
Poultry	1,965.60	2,050.00	2,150.00	2275.00	na
Million head					
Number slaughtered:					
Hogs	257.22	261.77	275.70	290.23	309.91
Cattle	5.55	6.33	8.58	9.43	10.55
Sheep & goats	52.27	56.52	68.27	81.22	91.00
Percent					
Slaughter rate:					
Hogs	77.6	77.6	84.1	82.26	87.8
Cattle	6.4	6.9	9.1	9.4	10.2
Sheep & goats	33.5	34.0	37.9	38.4	43.3
1,000 tons					
Production:					
Meat	19,171	19,860	21,936	23,262	25,135
Pork	17,960	18,349	20,176	21,228	22,811
Beef	589	792	958	1,072	1,256
Mutton	622	719	802	962	1,068
Poultry meat	1,879	2,020	2,744	2,820	na
Cow's milk	2,899	3,301	3,660	3,813	4,157
Sheep & goat's milk	430	487	529	570	347
Sheep's wool	185	209	222	237	na
Mohair	12	13	14	16	na
Cashmere	4	4	5	5	na
Eggs	5,550	5,902	6,955	7,198	7,946

na = not available

Source: China Agriculture Yearbook, 1986-90; 1991 Statistics Abstract.

Appendix table 5--China's major agricultural exports by volume, 1987-90

Item	Units	1987	1988	1989	1990
Swine, live	1,000 head	3,020	3,027	2,980	3,000
Poultry, live	1,000 head	41,150	44,180	44,840	47,840
Beef, fresh or frozen	Tons	33,587	53,986	56,493	96,593
Pork, fresh or frozen	Tons	99,964	63,484	88,423	124,236
Broiler, frozen	Tons	16,769	25,660	31,465	37,813
Rabbit meat, frozen	Tons	20,545	20,976	21,438	20,545
Eggs	Million	1,109	924	753	601
Food grain	1,000 tons	7,080	7,180	6,570	5,830
Rice	1,000 tons	1,020	700	320	330
Corn (maize)	1,000 tons	3,920	3,920	3,500	3,400
Soybeans	1,000 tons	1,710	1,480	1,260	940
Fruit	Tons	243,792	280,853	272,557	226,387
Oranges	Tons	76,160	74,705	70,514	65,624
Apples	Tons	60,345	87,859	70,331	62,425
Walnuts, in shell	Tons	9,777	8,370	8,684	5,247
Walnut meat	Tons	11,294	10,608	12,845	8,712
Chestnuts	Tons	35,966	35,292	33,296	36,022
Sugar	Tons	452,493	247,802	429,623	570,493
Natural honey	Tons	66,831	46,487	71,498	88,005
Tea	Tons	174,273	198,290	204,583	195,471
Canned food	Tons	536,958	554,176	548,355	565,748
Pork	Tons	93,757	81,528	86,341	90,906
Vegetables	Tons	329,843	333,224	332,143	332,708
Fruit	Tons	87,351	87,967	71,399	77,825
Beer	Tons	32,429	39,343	41,753	35,223
Flue-cured tobacco	Tons	17,019	19,367	21,931	27,511
Goatskin	1,000 pieces	721	1,145	7,890	9,140
Furskin, raw	1,000 pieces	844	435	3,800	4,660
Mink skin	1,000 pieces	270	174	2,660	2,720
Raw silk	Tons	9,234	9,404	12,819	7,604
Cotton	Tons	754,577	468,002	272,482	167,282
Cashmere	Tons	2,560	2,712	2,039	1,413
Rabbit hair	Tons	4,908	9,735	6,442	4,703
Oilseeds, edible	Tons	528,938	510,215	392,080	515,523
Peanuts and shelled peanuts	Tons	267,987	251,218	266,066	387,322
Vegetable oil	Tons	55,660	25,503	62,099	139,477
Cotton yarn	Tons	242,964	205,717	183,656	176,156

na = not available

Source: China's Customs Statistics, 1987-90

Appendix table 6--China's major agricultural exports by value, 1987-90

Item	1987	1988	1989	1990
U.S. \$1,000				
Swine, live	201,960	232,910	242,410	270,090
Poultry, live	71,750	76,540	76,940	84,530
Beef, fresh or frozen	55,320	107,980	105,940	158,740
Pork, fresh or frozen	172,080	115,820	159,300	215,480
Broilers, frozen	25,230	43,480	55,320	74,390
Rabbit meat, frozen	40,910	37,390	34,610	30,080
Eggs	42,850	41,130	40,070	28,610
Food grain	1,013,560	1,189,060	1,191,630	1,019,130
Rice	187,160	180,980	94,470	84,130
Corn (maize)	323,190	393,480	438,810	403,560
Soybeans	367,500	380,970	365,610	228,300
Fruit	101,360	125,710	135,365	102,880
Oranges	35,850	38,300	34,610	31,080
Apples	26,340	39,410	27,100	25,590
Walnuts, in shell	9,710	8,260	8,650	5,440
Walnut meat	24,870	23,510	27,160	18,500
Chestnuts	65,030	61,420	53,950	62,220
Sugar	90,560	62,040	161,400	229,910
Natural honey	53,750	37,020	56,140	71,710
Tea	362,490	401,970	420,790	412,710
Canned food	535,950	649,160	674,260	681,410
Pork	156,420	143,480	147,540	152,880
Vegetable	282,090	353,090	366,540	361,320
Fruit	59,940	58,730	51,710	53,250
Beer	13,580	20,640	25,180	19,570
Flue-cured tobacco	35,500	41,480	47,660	49,360
Goatskin	34,230	42,330	31,500	34,080
Furskin, raw	47,130	51,600	39,120	29,670
Mink skin	35,920	37,920	33,990	24,150
Raw silk	233,020	308,680	575,090	362,120
Cotton	756,100	718,850	431,150	300,540
Cashmere	127,760	190,610	194,540	141,740
Rabbit hair	156,420	230,390	137,320	96,800
Oilseeds, edible	272,490	260,260	248,460	352,200
Peanuts and shelled peanuts	182,90	170,220	189,960	271,120
Vegetable oil	30,930	17,370	39,460	95,420
Cotton yarn	535,110	511,770	424,210	390,200

na = not available

Source: China's Customs Statistics, 1987-90.

Appendix table 7--China's major agricultural imports by volume, 1987-90

Item	Units	1987	1988	1989	1990
Food grain	1,000 tons	16,170	15,330	16,580	13,720
Wheat	1,000 tons	13,200	14,550	14,880	12,530
Barley	1,000 tons	210	80	245,580	na
Rice	1,000 tons	na	na	1,200	60
Corn (maize)	1,000 tons	1,540	110	70	370
Dried beans	1,000 tons	40	30	40	30
Soybeans	1,000 tons	280	150	0	0
Sugar	Tons	1,826,814	3,708,940	1,580,635	1,132,122
Coffee & coffee extracts	Tons	1,564	2,849	6,174	987
Cocoa beans	Tons	14,474	16,777	23,980	10,074
Natural rubber	Tons	214,995	362,150	410,668	355,414
Synthetic rubber	Tons	40,405	40,974	47,044	44,487
Logs	1,000 tons	5,620	na	na	na
	1,000 cubic meters	6,090	9,320	6,050	4,150
Cotton	Tons	5,976	34,773	519,039	416,733
Jute & hemp	Tons	21,718	750	0	0
Wool	Tons	152,503	187,377	101,368	33,329
Animal oil & fats	Tons	111,503	119,839	98,201	93,483
Edible vegetable oil	Tons	521,428	213,721	1,056,156	1,122,832
Other vegetable oil	Tons	328,283	480,135	781,940	1,189,692
Oilseeds (other than soybeans)	Tons	685	1,443	0	0
Fertilizer, manufactured	Tons	10,897,287	14,706,323	13,933,013	16,275,945
Ammonia sulphate	Tons	48,012	78,507	0	0
Urea	Tons	5,566,830	8,492,246	7,940,709	8,146,840
Superphosphates	Tons	na	na	141,816	133,853
Potassium chloride	Tons	na	na	1,118,247	2,072,805
Compound fertilizer	Tons	na	na	964,647	4,629,397
Agricultural agent (chemicals)	Tons	10,062	34,142	36,591	28,487

na = not available.

Source: China's Customs Statistics, 1987-90.

Appendix table 8--China's major agricultural imports by value, 1987-90

Item	1987	1988	1989	1990
U.S. \$1,000				
Food grain	1,754,020	1,895,540	2,990,700	2,352,850
Wheat	1,362,380	1,731,040	2,581,200	2,156,530
Barley	21,170	8,640	44,150	na
Rice	na	na	304,030	11,600
Corn (maize)	150,530	12,060	9,270	47,580
Dried beans	10,950	11,980	16,480	8,720
Soybeans	61,230	37,080	280	320
Sugar	297,440	858,240	429,780	378,880
Coffee/coffee extracts	12,860	17,550	17,970	63,200
Cocoa beans	38,570	34,880	35,500	11,900
Natural rubber	326,740	429,040	376,480	285,530
Synthetic rubber	50,960	59,190	54,690	66,860
Logs	479,760	na	na	na
	na	899,760	601,860	460,560
Cotton	12,790	58,850	708,700	710,790
Jute & hemp	6,810	320	na	na
Wool	543,130	895,540	516,870	146,060
Animal oil & fats	40,680	50,370	39,930	37,660
Edible vegetable oils	186,040	94,820	498,310	528,270
Other vegetable oils	127,740	228,360	341,120	419,040
Oilseeds				
(other than soybeans)	330	700	na	na
Fertilizer (mnfctd)	1,399,230	2,335,490	2,363,650	2,605,100
Ammonia sulphate	3,250	6,920	na	na
Urea	584,420	1,218,150	1,169,800	1,156,090
Superphosphates	na	na	24,010	22,980
Potassium chloride	na	na	138,230	243,100
Compound fertilizer	na	na	215,200	964,860
Agricultural agent (chemicals)	55,830	156,270	196,200	177,140
na = not available				

Source: China's Customs Statistics, 1987-90

Appendix table 9--U.S. agricultural exports to China, 1988-90¹

Item	Fiscal years			Calendar years		
	1988	1989	1990	1988	1989	1990
1,000 tons						
Wheat	5,826	8,332	3,451	6,592	7,401	3,692
Corn	217	0	442	0	302	140
Tobacco	229	437	133	1	0	133
Cattle hides, whole ²	127	189	37	130	133	29
Soybeans	179	0	0	0	0	0
Cotton	489	186	162	20	196	183
Soybean oil	0	0		0	0	0
US \$ 1,000						
Wheat	524,056	1,225,371	544,030	697,838	1,108,656	497,348
Corn	17,602	0	48,560	0	33,527	15,033
Tobacco	1,180	2,491	938	3,671	0	938
Cattle hides, whole	6,786	7,791	1,831	6,214	5,410	1,295
Soybeans	35,859	0	0	0	0	0
Cotton	1,328	233,981	289,742	25,181	259,144	277,213
Soybean oil	0	0	0	0	0	0
Others	25,769	26,489	0	26,084	26,371	22,236
US \$ million						
Total agricultural	613	1,496	909	759	1,435	814
Total nonagricultural	4,129	na	4015	4,262	4,320	3,993
Total	4,742	na	4924	5,021	5,755	4,807

na = not available.

¹ U.S. domestic exports, f.a.s.-value basis. Exports include transshipments of agricultural products through Canada. ² Numbers in thousands.

Source: U.S. Bureau of the Census, "U.S. Agricultural Exports," country by commodity, monthly printouts; U.S. Department of Agriculture, Economic Research Service, U.S. Foreign Agricultural Trade Statistical Report, various issues.

Appendix table 10--Major U.S. agricultural imports from China, by calendar year, 1986-90¹

Item	1986	1987	1988	1989	1990
US \$ 1,000					
Meats and products, excluding poultry	24	1,300	380	272	137
Other meats, fresh or frozen	23	1,280	355	155	137
Poultry and products	23,265	35,513	31,729	40,408	39,383
Eggs	1,143	1,206	1,112	1,091	1,886
Feathers and down, crude	22,122	34,303	30,607	39,287	37,457
Hides and skins	1,080	909	3,625	74	770
Furskins	228	780	1,960	18	387
Wool, unmanufactured, apparel grades	2,101	3,615	4,621	3,511	1,497
Sausage casings	1,971	2,391	6,280	10,371	4,713
Silk, raw	3,060	4,259	4,744	11,097	7,455
All other animal products	19,528	23,658	20,987	18,085	12,692
Grains and feeds	4,037	4,987	5,079	8,057	6,995
Fruits and preparations	4,358	7,415	10,186	8,158	6,881
Fruits, prepared or preserved	4,355	7,410	10,169	8,021	6,802
Nuts and preparations	7,169	7,352	6,777	10,930	7,718
Vegetables and preparations	53,081	68,800	83,366	97,942	60,294
Vegetables, prepared or preserved	52,125	67,043	81,377	93,643	52,206
Mushrooms, canned	31,037	41,446	48,522	58,941	10,674
Waterchestnuts	13,369	16,393	17,082	15,267	15,168
Sugar and related products	11,622	6,298	6,166	9,575	10,584
Spices	7,843	7,902	6,048	7,159	4,960
Beverages	39,704	35,749	44,658	6,996	6,964
Coffee and products	452	404	153	135	94
Cocoa and products	10,294	6,286	13,994	8,578	11,572
Tea	16,469	14,215	20,169	21,699	23,385
Malt beverages	5,814	6,895	8,821	5,241	6,150
Oilseeds and products	3,687	4,172	6,884	3,976	3,217
Oilseeds and oilnuts	1,193	1,004	1,268	1,950	1,802
Oils and waxes, vegetable	2,494	3,168	4,112	1,997	1,407
Seeds, field and garden	1,579	2,974	3,525	6,733	9,968
Essential oils	13,376	13,754	19,321	13,924	16,782
Drugs, crude natural	4,637	7,343	8,522	10,133	15,083
All other vegetable products	3,874	9,218	10,967	4,964	5,217
Total agricultural commodities	204,278	237,463	279,531	319,233	270,618
Total nonagricultural commodities	4,467,222	5,957,837	8,231,369	11,669,032	14,953,382
Total imports	4,671,500	6,195,300	8,510,900	11,988,500	15,224,000

na = not available.

¹ Imports for consumption, customs-value basis.

Source: U.S. Department of Commerce, Bureau of the Census, "U.S. Agricultural Imports," country by commodity, annual printouts; U.S. Department of Agriculture, Economic Research Service, U.S. Foreign Agricultural Trade Statistical Report, various issues.

Appendix table 11--China's grain trade by country and calendar year, 1985-90

Item	1985	1986	1987	1988	1989
1,000 tons					
Net grain trade:	-1,658	50	11,028	10,268	10,350
Total exports	7,717	7,442	5,206	5,094	6,209
Total imports	6,059	7,492	16,234	15,362	16,559
Total wheat imports: ¹	5,626	6,383	13,942	14,872	15,044
Argentina	875	393	810	na	0
Australia	1,241	2,619	4,504	na	0
Canada	2,370	2,659	5,968	na	17
EC	324	145	725	na	26
United States	816	228	1,566	na	4
Japan	na	137	180	na	83
Wheat imports:	5,626	6,114	13,200	14,550	14,880
Argentina	875	534	810	304	1,049
Australia	1,214	2,616	4,432	397	1,677
Canada	2,370	2,538	5,699	7,532	1,761
EC	324	145	566	30	1,594
United States	816	226	1,564	5,768	8,293
Flour imports:	na	167	461	102	144
Argentina	na	0	0	0	0
Australia	na	2	45	0	1
Canada	na	75	167	33	17
EC	na	0	99	na	26
United States	na	1	1	3	4
Japan	na	85	112	57	84
Rice imports: ²	na	322	541	310	1,201
Australia	na	0	0	0	0
Burma	na	72	92	20	40
Korea, DPR	na	20	26	37	66
Thailand	na	230	316	253	1,002
United States	na	0	0	0	0
Coarse grain imports:	120	787	1,752	190	314
Argentina	5	30	143	0	0
Australia	65	42	95	30	176
Canada	0	157	94	52	70
EC	0	0	0	0	0
Thailand	67	509	169	0	1
United States	0	32	1,239	107	54
Corn imports:	80	588	1,541	109	68
Argentina	na	30	143	0	0
Australia	na	0	0	0	0
Canada	na	0	0	0	0
EC	na	0	0	0	0
Thailand	na	509	169	0	1
United States	na	32	1,228	107	54
Barley imports:	40	199	211	81	246
Australia	na	42	95	30	176
Canada	na	157	94	52	70
EC	na	0	0	0	0
United States	na	1	11	0	0

¹ Includes wheat flour.² Only imports of semi- or milled rice.

Source: China's Customs Statistics.

Appendix table 11--China's grain trade by country and calendar year,
1985-89--continued

Item	1985	1986	1987	1988	1989
1,000 tons					
Total grain exports	7,717	7,442	5,206	5,094	6,209
Rice exports:	1,019	950	1,022	698	314
Hong Kong	0	0	54	106	62
Iran	150	124	175	0	0
Macau	0	0	47	11	5
Sri Lanka	12	11	11	92	61
United Arab Emirates	132	82	10	6	5
Democratic Yemen	9	12	7	31	0
Benin	0	22	0	2	0
Angola	0	0	17	0	0
Guinea	0	21	0	19	15
Ivory Coast	0	81	109	0	0
Libya	30	41	31	20	20
Mauritius	37	50	51	54	47
France	46	11	0	0	0
Bulgaria	10	10	21	0	8
Czechoslovakia	50	41	41	30	20
German, DR	20	30	24	20	10
Poland	70	60	75	60	15
Romania	30	30	50	21	10
Switzerland	162	0	32	24	0
Brazil	3	70	0	0	0
Cuba	50	100	101	50	10
Peru	0	49	93	0	0
Coarse grain exports	6,698	6,492	4,184	4,396	4,520
Corn exports:	6,340	5,640	3,916	3,912	3,502
Korea, DPR	123	127	89	165	296
Hong Kong	1,046	761	218	238	116
Japan	2,461	2,709	1,600	1,504	1,289
Malaysia	14	0	20	144	182
Philippines	130	177	61	0	32
Singapore	289	16	42	172	127
German, FR	14	0	15	0	0
German, DR	0	85	21	98	83
Poland	0	104	104	0	0
USSR	1,605	1,603	1,720	1,447	1,183
Mexico	0	41	24	0	0
Other grain exports:	358	852	268	484	1,013
Hong Kong	na	140	44	105	280
Japan	na	540	194	294	385
Singapore	na	119	16	40	56

na = not available.

Source: Data for 1986-89 comes from China's Customs Administration, Summary Surveys of China's Customs Statistics, Beijing, 1986-88. Data for 1984-85 came from the Almanac of China's Foreign Economic Relations and Trade, 1985-86.

Appendix table 12--China's trade in other agricultural commodities by country, 1987-89

Item	1987	1988	1989
Tons			
Imports:			
Cotton	5,976	34,773	519,039
Pakistan	1,948	20,166	144,342
Egypt	3,822	1,986	1,284
Sudan	200	5,113	34,147
United States	1	940	227,908
Sugar	1,760,277	3,351,393	1,580,635
Australia	408,682	425,750	196,411
Cuba	396,415	1,350,261	794,097
Thailand	678,375	799,242	322,418
United States	177,164	0	451
Philippines	15,900	0	23
Exports:			
Cotton	754,576	468,002	272,483
Hong Kong	189,551	61,353	24,823
Indonesia	57,311	42,740	17,677
Japan	183,194	142,894	63,324
USSR	43,862	7,322	29,579
Thailand	36,434	14,381	17,336
E. Europe	83,424	72,626	34,751
Soybeans	1,710,141	1,477,324	1,247,648
Hong Kong	16,107	39,425	16,503
Indonesia	273,785	308,252	162,405
Japan	296,833	299,484	297,732
Malaysia	126,446	120,799	125,252
Singapore	31,731	57,393	17,090
USSR	816,343	509,762	499,967
E. Europe	28,446	33,920	23,370

Source: China's Customs Statistics, 1987-89.

Appendix table 13--China's average and yearend \$U.S. exchange rate, 1979-1990¹

	1979	1980	1981	1982	1983	1984
RMB/\$US						
Average	1.5550	1.4984	1.7045	1.9757	1.9757	2.3200
Yearend	1.4962	1.5303	1.7455	1.9227	1.9809	2.7957
	1985	1986	1987	1988	1989	1990
Yearend	2.9367	3.4528	3.7221	3.7221	3.7651	4.7832
Average	3.2015	3.7221	3.7221	3.7221	4.7221	5.2221

¹ Independent banking sources quoted in major Chinese and Hong Kong newspapers say the Yuan will undergo a step-by-step devaluation during 1991 to a rate of about 5.7 RMB/\$US (totalling approximately 10 percent). Through mid-May 1991, the Yuan had already undergone a number of small devaluations (April 9, April 20, and May 19).

Source: CPE Agriculture Report, Vol 4, No. 1, Jan/Feb 1991, p. 19; Far Eastern Economic Review, April 25, 1991, p. 46; China Daily, Nov 19, 1990, p. 1; Hong Kong AFP April 22 and May 18, 1991; and IMF International Financial Statistics, June 1985 and June 1991.

Table 14--China's other agricultural product output

	1987	1988	1989	1990
1,000 tons				
Sugar crops	55,504	61,875	58,038	72,145
Sugarcane	47,363	49,064	48,795	57,620
Sugarbeets	8,140	12,810	9,243	14,525
Sugar output	5,060	4,550	4,960	5,710
Tobacco	1,943	2,734	2,830	na
Flue-cured	1,634	2,337	2,405	2,259
Tea	508	545	535	540
Jute and hemp ¹	1,137	1,078	660	726
Silk cocoons	354	394	435	480
Aquatic products	9,550	10,610	11,520	12,370
Rubber	238	240	243	264
Fruit	16,678	16,661	18,319	18,744

na = not available

¹ Starting 1989, hemp figures are on a processed basis (conversion is 2kg raw equals 1kg processed).

Source: 1990 Statistical Yearbook and 1991 China Statistics Abstract.

Conversion Equivalents and Definitions

China	Metric	English	

1 mu	0.0667 ha		0.1647 acre
15 mu	1.0 ha		2.4711 acre
1 jin (catty)	0.5 kg =	.0005 ton	1.1023 lbs
1 dan (100 jin)	50.0 kg =	.05 ton	110.23 lbs
1 dun (ton)	1,000.0 kg =	1.00 ton	2,204.6 lbs
1 jin/mu	7.5 kg/ha	6.93 lbs./acre	
Crops:	Lbs./bu.	1.0 bu.	1.0 ton
Wheat, potatoes, soybeans	60	0.02722 ton	36.743 bushels
Rye, corn, and sorghum	56	0.02540 ton	39.368 bushels
Barley	48	0.02177 ton	45.929 bushels
Oats	32	0.01452 ton	68.894 bushels
Cotton (480-lb bale)	NA	NA	4.593 bales
Cotton (500-lb running bale)	NA	NA	1.409 bales

Exchange rate:

In 1990 U.S. \$1.00 averaged 5.2221 yuan.

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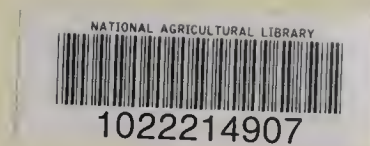
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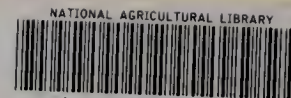
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